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Studies in the Asclepiadaceae.—III.

BY ANNA MURRAY VAIL.

I.—DESCRIPTIONS OF NEW SPECIES.

ASCLEPIAS SCAPOSA.

Minutely rough-puberulent with short, often curved hairs. Stems 1–several from the same fusiform tuberous root, apparently simple, 3–4 cm. high: leaves opposite, crowded, 3–4.5 cm. long; blades oblong-lanceolate, acutish at each end, sessile, coriaceous, pubescent with short scattered roughish hairs: peduncles solitary, terminal, 6–7 cm. long, about twice longer than the stem, terete, pubescent with spreading whitish hairs; pedicels 2 cm. long: follicels erect on recurved pedicels, 6 cm. long, linear-fusiform, pubescent. Flowers and seeds not seen.

New Mexico, near Santa Rita, Wright, 1851–52; mounted with no. 1684 in Herb. Columbia University and on the same sheet with no. 1683 in Herb. Gray.

In general aspect and foliage bearing a close resemblance to some of the species of Dr. Greene's new genus *Podostemma*, but differing from them by the very long, solitary, terminal peduncle. The discovery of the flowers may prove it to belong to that genus.

ASCLEPIAS PALMERI.

Cinereous-tomentulose up to the inflorescence. Stems several from the same root: internodes about the length of the leaves: leaves opposite, 1–3 cm. long, 2 mm. wide; blades linear, acumi-

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nate, coriaceous; margins revolute and twisted when dry: peduncles terminal, solitary or two, 4–10-flowered, 2–5 cm. long; pedicels 1.5 cm. long, filiform: corolla-segments oblong-lanceolate, acutish, 5 mm. long, dull purplish, or ash-colored, scarious margined; column distinct; hoods whitish, tinged with pink, about 2 mm. high, not exceeding the anthers, 5-dentate at the apex; central tooth and the two ventral infolded and acute intermediate ones rounded; horn arising from the base of the hood and leaving the middle tooth of the hood free; anther-wings small, salient and angled at the somewhat rounded base, or possibly obscurely notched: follicles erect on deflexed pedicels. Mature fruit not seen.

San Luis Potosi, Mexico, Parry & Palmer, no. 583, 1878.

Clearly a distinct species and very closely related to both *A. quinquedentata* and *A. Schaffneri* and seemingly intermediate between them. The leaves are, however, much shorter, there are fewer of them, and they are cinereous tomentulose with short, twisted, whitish hairs.

I have just received from Miss Alice Eastwood, the following description of an interesting *Asclepias* from Utah:

ASCLEPIAS MACROSPERMA Eastwood.

Asclepias involucrata var. *tomentosa*, Eastwood, Zoe., **4**: 129. 1893. Not *Asclepias tomentosa* Ell. 1817.

Stems several from a woody, horizontal rootstock, slender, decumbent, 6 cm. to 3 dm. long, tomentulose, angled. Leaves alternate, close together or scattered, 1–7 cm. long, 6 mm. to 2 cm. wide; blades lanceolate, ovate-lanceolate and the lowest orbicular; base subcordate, truncate or obtuse; apex acuminate; margin undulate, densely tomentulose; upper surface of leaves glabrous except for a few hairs on the veins, wrinkled; lower prominently veined, tomentulose: umbels one or two, terminal and lateral, closely sessile, many-flowered, with involucral leaves: pedicels about 1 cm. long, filiform, tomentulose: calyx-segments ovate-acuminate, 2½ mm. long, glabrous above, tomentulose below; corolla-segments 4–8 mm. long, 3 mm. wide, reflexed, membranously margined, with a notch in the margin and the solid portion of the leaf acute, thickened, rugulose and purplish below, puberulent and greenish above; column short but distinct; hoods erect, scarcely exceeding the anthers, rounded at the subtruncate summit, the ventral margins convolute; horn falcate, subulate, inflexed, slightly exserted over the anthers: anther-wings salient below the

middle, truncately rounded to the base, entire or minutely notched: follicles 6 cm. long, erect on recurved pedicels, 2 cm. long, obliquely ovate-acuminate, tomentulose, parallel-veined, tinged with reddish purple: seeds 13 mm. long, 1 cm. wide, broadly obovate, body light brown, marked with irregularly broken ridges converging to the axis; border 2 mm. wide, tan-colored, corrugated-rugose; coma 2 cm. long, copious.

Utah: Court House Wash, May, 1892; Willow Creek, San Juan Co., July, 1895.

Differing from *A. involucrata* in its larger size and stouter habit; broader, longer, and more coriaceous leaves, and much larger follicles and seeds. The differences in the horns and anthers are shown in the figures. The dorsal angle of the hood is more pronounced in *A. involucrata* and thicker. These two species are closely related; but since the differences appear to run through all parts and the vegetative distinctions are readily recognized, it seems best, as Miss Vail has suggested, to regard this as a distinct species.

II.—NOTES ON ASCLEPIAS VERTICILLATA AND SOME NEARLY RELATED SPECIES.

In the large amount of material pertaining to *Asclepias verticillata* and its two varieties which has passed through my hands during the past year, several recurring forms have convinced me that there are more than a single species with two forms to be segregated from it. I am not at all prepared to say that I have solved the question, for in the matter of nomenclature as well as in the study of the plants themselves, there is still considerable research to be made, and I offer this only as a preliminary study with a hope that it may bring to me more material for a longer and fuller investigation. The rootstocks, in many cases, have shown interesting features, but as that portion of the plant in *Asclepias* is most difficult to collect, it is only in rare cases that satisfactory specimens have come under my notice, and I have not been able to examine enough of them to determine whether they possess constant characters or not.

The well-known and well-defined *Asclepias Mexicana* of the West Coast is included in this study, as some of its narrow-leaved forms have become confounded with what I take to be *A. galioides* H.B.K.

The following key, perhaps, will be a help in recognizing the species as I now understand them:

Key to the Species.

§ Follicles erect on erect fruiting pedicels.

Flowers greenish and white, or in no. 1 sometimes tinged with purple on the outside.

Hoods not exceeding the anthers.

Leaves verticillate in whorls of 2–4's, narrowly linear; rootstock short, covered with fibrous rootlets. 1. *A. verticillata.*

Leaves very crowded, whorled or scattered, filiform, 2–3 cm. long; stems tufted from a woody rootstock. 2. *A. pumila.*

Leaves approximated in whorls of 3–6's, not crowded, linear, 4–10 cm. long; stems solitary or tufted from a long horizontal rootstock. 3. *A. galioides.*

Leaves approximated in whorls of 3–4's, narrowly linear, 4–10 cm. long, close and crowded at the base, elongated and often opposite above. 4. *A. subverticillata.*

Leaves opposite, linear, 4–8 cm. long; margins slightly revolute: umbels lateral, small. 5. *A. linearis.*

Hoods exceeding the anthers; leaves opposite, linear, 7–14 cm. long; umbels few, corymbosely terminal. 6. *A. linifolia.*

Flowers ash-colored or the hoods whitish; leaves lanceolate or linear-lanceolate, spreading or falcate-reflexed, 6–12 cm. long, with ascending veins. 7. *A. Mexicana.*

1. ASCLEPIAS VERTICILLATA L. Sp. Pl. 217. 1753.

This species was based on "*Asclepias foliis verticillatis linearis-setaceis*" Gronovius, Virg. 26. 1739, which in its turn was founded on "*Apocynum Marianum erectum Linariae angustissimus foliis umbellatum—Apocyno recto non ramoso. Rorismarini foliis umbellis florum candidis*" Plunkenet, Mantissa, 17. *pl. 336.* 1700. The figure is a very good one, and there is no doubt as to what plant was intended. It is the species common on our eastern seaboard and western praires; but probably not what passes as *Asclepias verticillata* in Mexico nor the forms known as *A. verticillata* var. *subverticillata* in the Southwestern States.*

The species as we know it in the vicinity of New York, as well as from specimens collected all over the country, seem very constant in the following important characters:

* *Asclepias Simpsoni* Chapm. Fl. ed. 3, 346. 1897, a low pine barren species from South Florida, is nearly related to *A. verticellata*, but I have not seen authentic specimens of it.

Rootstock short, covered with numerous fibrous rootlets, stems angled, glabrate or minutely pubescent in lines, simple or more rarely branched. Leaves opposite or whorled (in depauperate specimens sometimes all of the upper leaves are opposite), all very slender and revolute, though specimens are found which have plane leaves. The umbels are rarely more than 2.5 cm. in diameter, and are situated in alternate axils of the leaves, though occasionally a specimen is seen with opposite umbels and more rarely with two or three umbels together, or in some robust specimens an umbel is seen for each leaf. The corolla-segments are greenish, with sometimes slight traces of purple on the outer surface; hoods white, with a darker keel when dry, truncate at the apex, lobed at the distinctly angled sides, scarcely reaching the summit of the anthers; anther-wings entire or minutely notched. The horns are much exserted and often meet or overlap over the stigma.

It occurs in dry and often sterile soil from Maine to the Northwest Territory, south to Florida, and Texas. It may also possibly be found in Arizona, and I have seen two specimens from New Mexico (Vasey, Herrick), but as yet have not seen any from Mexico which I could refer to *A. verticillata*. The species so-called which does occur there is, I am inclined to think, *Asclepias galioides* H.B.K. and a good species.

In Hemsley, Biol. Centr. Am. **2**: 327, 1881–82, *A. verticillata* is listed as a Mexican species, but the plants enumerated in confirmation of the statement, those of Parry and Hartweg, are what have been known as *A. verticillata* var. *subverticillata*. Hartweg's plant from Leon, Mexico, is so labeled in Herb. Gray, and in every particular answers the description of the plant of H.B.K.

2. ASCLEPIAS PUMILA (A. Gray) Vail; Britt. & Brown, Ill. Fl. **3**: 12. *f. 2921*. 1898. Ined.

Asclepias verticillata var. *pumila* A. Gray, Proc. Am. Acad. **12**: 71. 1876.

This species is characterized by a ligneous base and short woody rootstock apparently without the fascicled fibrous rootlets of *A. verticillata*. The stems are lower with the same narrowly linear or filiform revolute margined leaves, but commonly much

more crowded and scattered, and numerous and small umbels of white flowers which are solitary or corymbosely disposed at the summit of the stems. This species occurs on dry plains from South Dakota to Arkansas, Colorado and New Mexico. It may possibly intergrade with *A. verticillata*, but a long series of specimens are constant to the above characters.

3. ASCLEPIAS GALIOIDES H.B.K. Nov. Gen. et Spec. **3**: 188. 1818.

Asclepias verticillata var. *subverticillata* A. Gray, Proc. Am. Acad. **12**: 71. 1876. In part.

Glabrous except for the minutely pubescent stems and pedicels. Stems erect, solitary or fasicled? from a sometimes long horizontal rootstock, 4–10 dm. high or more, glabrous or minutely pubescent in lines above, simple or branched: leaves commonly erect or spreading, in whorls of 3–6; blades narrowly linear, 6–8 or possibly 10 cm. long, 1–2.5 mm. wide, usually coriaceous; margins entire or revolute; midvein conspicuous beneath and the veins obsolete: inflorescence cymosely terminal or often many of the umbels also lateral: peduncles longer than the 1 cm. long pedicels and shorter than the leaves: umbels 2–3 cm. in diameter: corolla-segments greenish white, oblong, obtuse, 4 mm. long: column nearly 1 mm. high, slender: hood nearly reaching the summit of the anthers, erect-spreading, broadly rounded at the apex, the dorsally hastate-sagittate ventral margins slightly involute, entire; horn arising from the base of the hood, flat, long-exserted and somewhat inflexed over the anthers: anther-wings slender, minutely notched at the angled base: follicles 5–7 cm. long, glabrous or minutely puberulent, acute or attenuate above: seeds 5–6 mm. long, thin, glabrous; coma 2.5 cm. long.

Kansas: Popinoe, no. 34, 1875. *Colorado:* Eastwood. *New Mexico:* Lieut. Abert; Wright, low grounds, near San Elizario, 1° to 3° high, June 14th, no. 1685, nos. 1688 and 1689, 1852; Fendler, no. 694; Rothrock, no. 77; Vasey; Dewey; Manson and Hopkins, 1889. *Arizona:* Toumey, no. 248; Lemmon; Knowlton, nos. 219 and 224; M. E. Jones, no. 4063; Rusby, 1883; Palmer; MacDougal, no. 386; Mexican Boundary Survey, no. 1078. *Mexico:* Hartweg, no. 216; Schaffner, no. 59; Sonora Valley, Schott; Parry and Palmer, no. 584; Palmer, no. 809; Parras, Gregg; Edwards.

Some of these specimens (Popinoe, Rothrock, Gregg, etc.) are

very close to some narrower leaved forms of *Asclepias Mexicana*. A specimen of Dr. Rusby's collection of 1880 from the neighborhood of Santa Fe, N. Mex., in Herb. U. S. Nat. Mus., is considerably lower than any of the specimens mentioned above, is less than 2 dm. high and more bushy than any of the plants enumerated here.

The *A. verticillata*, no. 1078 of the Mex. Bound. collection, is undoubtedly the same as Hartweg's plant, and I believe is also the plant described as *A. galioides H.B.K.* and neither are connected with *A. verticillata* except as to their verticillate leaves and small white flowers. A close study of the flowers of *A. verticillata* will reveal characters which do not belong to those of *A. galioides*.

The hoods in *A. verticillata* are nearly as truncate at the base as at the summit, and have a very noticeable involute angle or lobe on the ventral margins. On the contrary, Hartweg's specimen and with it all the so called *A. verticillata* var. *subverticillata* from the Southwest have hoods which are rounded at the summit, with infolded ventral margins and a gradually decurrent base which is but slightly truncate.

In E. Fournier's study of some Mexican Asclepiads (Ann. Sci. Nat. VI. **14**: 373. 1882) two forms are given of the species as occurring in Mexico, preceded by a general description after the habit of many foreign botanists. Under "Foliis angustioribus," var. *α galioides* Kunth is included all the North American material, apparently based on the plate in Hooker, Fl. Bor. Am. **2**: 54. *pl. 144.* 1834, which is undoubtedly the true *A. verticillata* (though the enlargement of the hood is a very bad one) and is the only reference to the North American forms, for the other specimens given are Lindheimer, Fasc. III, no. 456* and Fasc. IV., no. 657; Fendler, no. 694; Parry and Palmer, no. 584 from San Luis Potosi; Hartweg, no. 216; Bonpland, no. 4304 from Lake Cuses, Mexico; most of which are forms of *A. galioides* H.B.K.

Under "Foliis latioribus" var. *β. Mexicana* Cav. is all the material which we know as *Asclepias Mexicana*, a species which occurs from Idaho to Mexico and of which a very good plate is given in Cavanilles, Icones, **1**: 42. *pl. 58.* 1791.

*For this number see *Asclepias subverticillata.*

4. ASCLEPIAS SUBVERTICILLATA (A. Gray).

Asclepias verticillata, var. *galioides* Torr. Mex. Bound. Surv. 164. 1859. In part.

Asclepias verticillata, var. *subverticillata* A. Gray, Proc. Am. Acad. **12**: 71. 1876. In part.

Glabrous except the minutely pubescent stems and pedicels. Stems slender, erect, 2–3 dm. high, from a slender vertical root-stock, simple or branched; internodes at the base of the stems 5–10 cm. long; leaf-scars remaining conspicuous: leaves crowded, opposite above, otherwise verticillate in threes or fours; blades narrowly linear, 4–10 cm. long, 1–2 mm. wide, acute at each end, coriaceous, with a whitish midvein: umbels 4–8, lateral and terminal, 2–2.5 cm. in diameter, corymbosely disposed at or near the summit of the stem, commonly many-flowered: peduncles longer than the minutely pubescent pedicels and considerably shorter than the upper often elongated leaves: corolla-segments greenish-white, 4–5 mm. long, obtuse or acutish: column nearly 1 mm. high: hoods erect-spreading, nearly as high as the anthers, dorsally hastate-sagittate at the base, broadly rounded at the summit, the ventral margins rounded, not angled at the slightly involute middle: anther-wings narrow, very slender, prominently sagittate at the minutely notched base: follicles 8 cm. long, slender, long-acuminate, minutely puberulous: seeds about 4 mm. long; coma 2 cm. long. Mature fruit not seen.

New Mexico: Wright, no. 1686, 1851–52, in Herb. Columbia University. *Western Texas:* Wright, "mountain valley beyond the Limpia, Aug. 26th," no. 550, and "valley, 20 miles beyond the Pecos, Aug. 17," no. 551, 1849 in Herb. Gray. *Arizona:* Fort Verde, E. A. Mearns, no. 235, in Herb. Columbia University.

Asclepias verticillata, var. *subverticillata* was established by Dr. Gray, based "chiefly" on *Asclepias verticillata*, var. *galioides* Torrey (Mex. Bound. Surv. 164. 1859). In that publication Dr. Torrey bases his variety on a specimen of Parry's from Sonora and New Mexico, and on three numbers of Charles Wright's collection of 1851–52, nos. 1685, 1686 and 1689, adding that "our plant seems to be the same as Hartweg's no. 216." Specimens of these last-mentioned numbers are preserved in the Herbaria of Columbia University, Harvard University, and the U. S. Nat. Museum. I am not sure that I have seen Parry's specimen, which, according to the copy of the Report of the Mexican Boundary Survey an-

notated by Dr. Torrey, should be numbered 1078a. A specimen from this collection in the Herbarium of the U. S. Nat. Museum answers the description very well, but lacks any kind of a number so I do not like to refer to it with certainty. The first number of Wright's (1685), is undoubtedly the same as Hartweg's plant and is *A. galioides*, H.B.K.; but the no. 1686 seems to show a marked variation which is rather striking. The same plant occurs is Wright's Western Texas collection and more recently has been found at Fort Verde, Arizona.

A low (2–3 dm. high), slender plant, with remarkably crowded, long, narrowly linear leaves which are verticillate in fours or the uppermost in twos or threes. The internodes at the base of the stem are only from 6–10 mm. long and the leaf-scars are conspicuous, a character which I have not noticed on any other forms. I have little doubt but that this is a good species and give it the name of *Asclepias subverticillata* as it is included in Dr. Gray's variety.

5. ASCLEPIAS LINEARIS Scheele, Linnaea, **21**: 758. 1848.

Glabrous except the minutely pubescent stems and pedicels. Stems terete, angulate above, 2–5 dm. high, from a rather slender, short rootstock, covered with few ligneous? rootlets, simple or branched near the base, minutely pubescent, commonly in lines above: leaves narrowly linear, 4–8 or 10 cm. long, 1–3 mm. wide, elongated, acute, glabrous or with few scattered hairs, 1–nerved, the veins obsolete, coriaceous, margins revolute: peduncles longer than the 1 cm. long, filiform, minutely puberulous pedicels, but much shorter than the leaves: umbels 3–8, all lateral, 1.5–2.5 cm. in diameter, few to several-flowered; column slender, conspicuous: corolla-segments greenish white, about 4 mm. long, elliptical-oblong, acutish: hoods erect-spreading, broadly truncate at the summit, truncate at the hastate-sagittate obscurely clawed base; ventral margins with rounded angles or lobes at the middle, somewhat involute: horn flat, arising from the keel of the hood near its base, arcuate, horizontally long-exserted over the anthers, often dorsally angled at about the middle: anther-wings very slender, minutely notched at the angled base. Follicles not seen.

Southwestern Texas: Lindheimer, nos. 348 and 631 in Herb. Gray, no. 456 in Herb. U. S. Nat. Mus.; Guadalupe, 105 miles southwest of San Antonio, Edward Palmer, no. 810 in Herb. Gray

and Herb. Canby; San Diego, Miss Mary B. Croft, no. 209 in Herb. Columbia University.

The specimen on which *Asclepias linearis* Scheele was based is said to grow "gesellshaftlich auf schwarzem Thonboden und feuchter Prairie bei Neubraunfels: Lindheimer, Aug." A specimen from that region growing in "hard, clayey soil, N. Br." collected by Lindheimer and labelled *Asclepias linifolia*, no. 631, June 1851, is preserved in Herb. Gray. It is annotated by Dr. Gray as *Asclepias verticillata* var. *subverticillata*. It is undoubtedly the plant described by Scheele, and is more nearly related to *Asclepias verticillata* than the other plants which have passed as so-called varieties. An *Asclepias verticillata*, var. *linearis* has recently been established by C. L. Pollard (Bull. Tor. Bot. Club, **24**: 156. 1856), but the specimens so labeled which have come to us are only depauperate specimens of the true *Asclepias verticellata* and not the plants described by Scheele.

In Roemer and Schultes, Syst. **6**: 70. 1820 under *Asclepias angustifolia* there is a reference to an "*Ascl. linearis*." I have not been able to trace this species and retain the name for the Texan plant until I can determine to what species the earlier publication of it applies.

6. ASCLEPIAS LINIFOLIA H.B.K. Nov. Gen. et Sp. **3**: 190. 1818.

Asclepias salicifolia Lodd. Bot. Cab. *pl. 272*. 1823.

Asclepias Arizonica Greene. Name only in Herb. Gray.

A low shrub, glabrous except for a minute pubescence on stems and pedicels. Stems erect, 4–6 dm. or 1 m. high, solitary or several together or 1–2 or more at intervals from a stout rootstock, commonly branched, minutely pubescent, mostly in lines above: leaves opposite, tapering to a slender petiole; blades narrowly linear, 7–14 cm. long, 2–3 or 4 cm. wide, acute at each end, glabrous; margins often revolute; midvein whitish, the widest leaves with obscure but ascending veins: umbels lateral, several, on peduncles longer than the 1 cm. long pedicels, several to many-flowered: corolla-segments greenish-white, 3.5–4.5 mm. long, acutish: hoods erect, white, one-third higher than the anthers, rounded at the summit, dorsally hastate-sagittate at the base; ventral margins slightly involute, entire; horn flat, falcate, adnate to the keel of the hood from the base up to about the middle, long-exserted

over the anthers: anther-wings slender, angled and salient at the base, apparently entire: follicles very slender, 4–4.5 cm. long, glabrous, tapering at each end: seeds 4 mm. long, very thin: coma 1.5 cm. long.

A species easy to distinguish from its allies by the hoods, which exceed the anthers, a character which never occurs in any of the species enumerated above as being related to *A. verticillata.*

Arizona: Santa Catalina Mts., Lemmon, 1881, and "by streams of Santa Catalina Mts.," Pringle, 1881; Huachuca Mts., Lemmon, 1882; Fort Huachuca, T. E. Wilcox, 1892. *Mexico:* San Luis Potosi, Schaffner, no. 58, in Herb. Canby; State of Nuevo Leon, Pringle, no. 1895 in Herb. Columbia University.

A small specimen said to have grown "in Mr. Hogg's garden 1825, raised from seeds collected by Dr. James in Long's Expedition to the Rocky Mountains" is preserved in Herb. Torrey. It appears to belong here, but the flowers are in too poor a condition to make it certain. The sheet on which it is pasted bears a note by Dr. Gray to the effect that "it most likely equals *A. virgata* Lagasca, but has the horn too long."

A specimen from San Luis Potosi, collected by Parry and Palmer, no. 581, might also be referred to this species and in fact it is partly so labelled, but it is much more branching in habit and has somewhat shorter leaves.

Asclepias linifolia is referred to *Asclepias angustifolia* Schweiger, Enum. Hort. Bot. Regiomont, 13. 1812 by Hemsley, but Fournier (Ann. Sci. Nat. VI. **14**: 376. 1882) notes that it would be difficult to determine whether it belongs to *A. linifolia* or to *A. virgata* Lag. (1804). I have seen no authentic specimens of the latter species. It is said to have "Corollae albae, colore roseo-livido suffusae."

The plant in Loddiges' Catalogue was made from a specimen raised from seed, habitat unknown, but it seems to be our plant except for the somewhat broader leaves, and is the same as and probably the origin of many garden specimens.

Should all of these names fail to belong here I have added to them the name which appears on a plant collected by Lemmon in Herb. Gray, Prof. Greene having long ago recognized it as a good species.

7. ASCLEPIAS MEXICANA Cav. Ic. 1: 42. *pl. 58.* 1791.

This species is a tall, stout, branched plant, woody at the base, from a short rootstock, with linear-lanceolate, spreading leaves, which are whorled in 3–5's, acute at each end, with ascending veins. In some specimens the upper leaves are plicate and falcately drooping. Inflorescence cymosely terminal and often numerous umbels in two or three of the lower axils. The umbels are about twice or more larger than those of *A. verticillata* and in some cases a little smaller than those of *A. galioides.* The flowers are also commonly more numerous than in either of the foregoing species, the corolla-segments are ash-colored and the hoods white; the ventral margins of the latter are rounded and without the distinct angle or lobe of *A. verticillata* and with a somewhat shorter horn. The follicles are slightly larger and less slender and the plant usually fruits more abundantly than those of *A. verticillata.*

A species common in the Western States and which varies greatly in the size of the leaves and the color of the flowers. Smaller, more slender forms have been collected in eastern Oregon by F. E. Lloyd; in Lake County, California, by Mrs. O'Neil, apparently growing with the type; they are probably only young plants. Another quite remarkable form, with uniformly shorter, very coriaceous leaves, comes from Mexico, where it has been collected by Pringle, no 2574, as to specimen in Herb. Columbia University.

New American Hepaticae.

By Marshall A. Howe.

(Plates 336, 337.)

Scapania (?) heterophylla.

Plants obscurely complanate, dark green, often bleaching at apices on drying, erect or ascending, forming compact cushions: stems 4–6 cm. high from a rhizomatous base, rigid, fastigiately and subdichotomously branched, brown, becoming almost black, nearly or wholly destitute of root-hairs, denudate below, 20–30 cells in thickness: leaves scarcely increasing in size upward, sometimes smaller at the stem-apex, the upper erecto-patent, subimbricate, the lower approximate, more spreading, often with squarrose tips, all strongly undulate-crisped both when moist and when dry, bilobed to the middle or bipartite, complicate, the carina acute or somewhat rounded, but never winged, the lobes sometimes almost disunited; now and then with an unlobed leaf irregularly interpolated, most frequently in the position of an underleaf; margins of the lower leaves commonly erose, of the upper entire or sparingly denticulate; ventral lobes twice as large as the dorsal or subequal, 1.7–2.5 mm. in length, .85–1.6 mm. in maximum width, broadly obovate, elliptical, or obovate-oblong, usually decurrent, mostly rounded-obtuse at apex; dorsal lobes obtuse, obliquely and broadly ovate or elliptical, not decurrent, sometimes appressed at stem-apex, especially on the younger shoots, but mostly ascending or slightly squarrose-reflexed: leaf-cells generally opaque, with smooth or slightly roughened cuticle, near the margin subquadrate or roundish-hexagonal, 16–28 μ, near the base oblong, 60–90 μ × 25–30 μ; trigones indistinct or wanting: remaining parts unknown. (Plate 336.)

On submerged stones in a cold mountain stream (alt. 3500 ft.) in company with *Chiloscyphus polyanthos rivularis* and *Porella rivularis*, Sisson, Siskiyou Co., California, July, 1894 (Howe, no. 34).

The stream, which is formed by a great spring beside the railway track about three-fourths of a mile north of the village of Sisson, is said to maintain nearly a uniform volume throughout the year, and as the plants were found wholly under water in the last

of July and the first of August, it is probable that their submersion is permanent.

The plant described above was referred at first, uncritically, to *Scapania undulata* and listed under that name in Erythea (4: 49. 1896). From *S. undulata*, however, it is certainly very distinct in the obscurely complanate branches, in the sometimes 3-ranked, often more deeply lobed, erecto-patent, never alate-carinate, leaves, with more or less squarrose tips, and in the obovate rather than round-trapezoidal ventral lobes. The interpolated unlobed leaves stand sometimes in about the general position of dorsal or ventral lobes, but more often squarely subtend the ventral surface of the stem. They can doubtless be explained in some cases, from the point of view of ontogeny, by the separation of the normally united lobes, but in other cases this hypothesis seems to find little justification. We have noticed one or two *three*-lobed leaves out of hundreds examined and in such the complete disjunction of the most ventral lobe would have thrown it nearly into the place of an underleaf. When the leaf-lobes are subequal it is often difficult to distinguish between the dorsal and ventral aspects of the stem, especially if further confused by the presence of the supernumerary entire leaves. From stems of such a character as this, however, may spring young shoots in which the leaves are regularly distichous and acutely complicate, in the ordinary *Scapania* fashion, with the ventral lobes twice the size of the dorsal. In the axils of the upper leaves are sometimes to be found numerous short clavate paraphyses, unicellular or of two or three oblong cells in a lineal series.

It is possible that the species deserves to be separated generically from *Scapania*, but in absence of perianth and sporogonium, we can do no better than refer it to a genus with which it surely has very much in common. Our material is sufficiently ample to allow its distribution at an early date in Underwood and Cook's *Hepaticae Americanae*.

RICCIA TRICHOCARPA.

Thallus in rosettes about 2 cm. in diameter or forming somewhat irregularly radiating masses; the principal divisions linear, 2–6 times dichotomous, .75–1.5 (mostly 1) mm. in width, often

black below and at margins, densely clothed at the sides with white or tawny setæ .3–.65 mm. long, those toward the apices often in as many as 8–12 irregular series, mostly distinct at insertion, with sharp, rigid, rarely slightly uncinate points, the terminal thallus-lobes obcuneate or oblong-elliptical, obtuse or subacute, narrowly and rather deeply unicanaliculate toward the apices or subbicanaliculate, the furrow at the extremities commonly concealed by the trichomes, the median sulcus sometimes nearly vanishing toward the base, margins obtusely rounded, tumid, often connivent on drying, the furrow then thatched by the somewhat forwardly directed setæ; dorsal surface light green, minutely and regularly reticulate; ventral surface nearly plane and flat, with a few very inconspicuous scales on either side of the median line at the apices, falsely squamose in the basal parts through delamination due to marcescence; width of transverse sections 1.6–3 times their height, the posterior subquadrangular with a light median sulcus, the margins becoming more tumid and rounded in proceeding toward the apex and the sulcus now and then double, the sections convex ventrally only in the extreme apical region; 20–28 cells in thickness, texture nearly solid, the air-chambers narrow and vertical; epidermis primarily bistratose, the superficial layer at first papillate, afterwards collapsed, and in the older parts reduced to a flattened cellulose membrane incumbent on the lower layer: monoicous: antheridia scattered, the ostioles elevated about .1 mm.: sporogonia numerous, in a single or double series, immersed, finally—especially when dry—hemispherical-protuberant above, together with the long-unruptured covering, or subconical, the covering marked with a dark-purple spot and bearing with rare exceptions 1–12 setae; spores soon black and very opaque, narrowly or not at all margined, 90–120 μ in maximum diameter, minutely granulose-papillate, with 9–12 areolae (visible only in the younger spores) across the convex face, the walls of these with irregularly thickened and salient angles, thus often giving this face in profile the appearance of bearing columnar or wart-like elevations, areolae across one of the plane faces 5–7 in number, scarcely elevated at the angles. (Plate 337.)

On rather dry and rocky soil. *California:* about San Francisco, "Mission Dolores," "Turk St.," "near Ocean House" (Dr. Bolander), Mission Dolores (Howe); Berkeley (Howe); Ukiah (Howe); San Mateo Co. (Prof. D. H. Campbell); Palo Alto (S. E. Brown); Santa Ana Hills (Parish); Pasadena (McClatchie).

EXSICC. Hep. Bor.-Am. 143[b] (as *R. tumida* Lindenb.).

Hep. Am. 138 (as *R. arvensis* Aust., var. *hirta* Aust.).

The above is the Californian *Riccia* that has been referred variously by American authors to *Riccia ciliata* Hoffm., *R. tumida* Lindenb., *R. intumescens* Aust. MS., Underw. (*R. ciliata* Hoffm., var. *intumescens* Bisch.) and more recently to *Riccia hirta* Aust. (*R. arvensis* Aust., var. *hirta* Aust.). But *Riccia arvensis hirta** known only from Mr. Austin's specimens from the neighborhood of Closter, New Jersey, bears comparatively few, short, usually blunt-pointed and incurved papilla-like cilia .1–.3 mm. long (not *setae*), the thallus is strongly incrassate-carinate ventrally, the margins are acute, the epidermis is very thick, of 2 or 3 layers of

* The relationship of Mr. Austin's var. *hirta* of his *Riccia arvensis* to his *Riccia Lescuriana* is still obscure to us. A study of Hep. Bor.-Am. 141 (*R. arvensis*) and Hep. Bor.-Am. 143 (*R. Lescuriana*), which may fairly be considered the types of these species inasmuch as they were cited after the original diagnoses (Proc. Acad. Nat. Sci. Philad. **1869**: 232. 1869), though not distributed until four years later, shows important differences between the two. *R. Lescuriana* is a larger plant, with longer and broader segments, and its spores are 75–100 μ in maximum diameter, with thick-walled, strongly defined areolae on the outer face, 7 or 8 measuring its width, the inner faces nearly smooth, minutely granulate-papillate, or very faintly and irregularly reticulate, while *Riccia arvensis* has somewhat smaller spores (70–90 μ) with all the faces distinctly and almost equally areolate. But Hep. Bor.-Am. 142, issued as *R. arvensis* Aust. var. *hirta* and cited by Mr. Austin after his original description of this variety, in Professor Underwood's set agrees with *R. Lescuriana* in every detail of importance; in the copy in the possession of Columbia University, however, we find a plant intermediate between the typical *R. arvensis* and *R. Lescuriana* both as to thallus- and spore-characters, mixed with *R. sorocarpa* Bisch. In all the specimens alluded to, the cilia when present are confined to the margin, though in the original description of the var. *hirta* (*l. c.*) we read, "*supra omnino hirta*," which, however, in the Hep. Bor.-Am. was changed to "*supra usitate hirta.*" But there is, in the possession of Professor Underwood, a specimen labeled in Mr. Austin's handwriting simply, "Rocks, Palisades, N. J., C. F. A., Sept. 1863," in which the short cilia are not confined to the margin but are scattered over the dorsal surface. The spores in the latter are nearly like those of the typical *Riccia arvensis*, but there are differences in general habit, in the form of the lobes, and in the character of the median sulcus which make its reference to the same species doubtful. But whatever the relation of *R. arvensis hirta* to *R. Lescuriana*, none of the New Jersey specimens have anything to do specifically with the Californian plant described above.

It may be remarked that *R. Lescuriana* was considered by Lindberg (Musc. Scand. 2, 1879) a synonym of *R. Michelii* Raddi; but *R. Michelii* ("*typica* * * * *e loco classico*") according to a specimen which we owe to the kindness of Dr. Levier of Florence, has spores that are distinctly reticulate on the inner faces, while those of *R. Lescuriana* are typically quite otherwise as already indicated; moreover, *R. Michelii*, together with its varieties, is said by Dr. Levier to be always dioicous, while the American plant appears to be always clearly monoicous. The antheridial ostioles are equally prominent in both.

decolorate or purpie-tinged cells, the somewhat smaller, more distinctly margined spores are fuscous-brown at maturity and always show their areolae quite clearly in glycerine instead of being densely black and opaque as in *R. trichocarpa* under the same treatment, the plants are mainly smaller and less frequently dichotomous, the thallus-segments are usually comparatively broader, reddish-purple below and more evidently squamigerous.

A much nearer ally of *Riccia trichocarpa* is doubtless *R. ciliata* Hoffm. of Europe. From the typical form of this, however, the Californian plant is clearly distinct in the shorter and much more abundant setae (these often reach 1 mm. in length in *R. ciliata*), in the presence of trichomes over the sporogonia, in the rather larger size of the thallus, more acute-angled dichotomy, and in the commonly black margins and sides. From *R. ciliata* var. *intumescens* Bisch., known to us only from the excellent figures and description of its author, our specimens evidently differ in the longer, narrower segments, in the even more crowded lateral setae, those toward the apex often in as many as 8–12 irregular series, and in the normal presence of 1–12 long trichomes above each sporogonium, while in regard to the "cilia" of *R. ciliata intumescens* Bischoff* says, "*rarius quoque in superficie frondis dispersa.*" In *R. ciliata*, the tissues covering the mature sporogonium soon become thin, scarious, and shining, and finally break away in fragments, exposing the capsule and the spores, and Bischoff remarks of the capsules of the var. *intumescens*: "*post maturitatem rupti, foveolas sporis repletas in frondis pagina superiore relinquentes*"; while in *R. trichocarpa* the covering of the capsules remains very long intact—indeed, in only one case out of several specimens with spores evidently much past maturity, have we seen the contents of a capsule exposed by natural agencies.

Riccia crinita Tayl. from Swan River, Australia (Drummond, no. 42), the original of which we have seen through the kindness of Dr. B. L. Robinson, is close to *R. trichocarpa* in character and number of setae, which also sometimes occur over the sporogonia. But *R. crinita* is a smaller plant, only 2 or 3 times dichotomous, with shorter, oblong rather than linear segments, the thallus is

* Acta. Acad. Caes. Leop. Carol. Nat. Cur. **17**: 1063. 1835.

comparatively much thinner, the vertical sections of its segments being 3–7 times as wide as high, the margins are acute and commonly incurved; the spores (possibly not arrived at full depth of color) are light-brown, 75–90 μ in maximum diameter, with 11–14 smaller areolae across the convex face, this scarcely papillate in profile, the plane faces similarly areolate, the mesh-forming ridges throughout and the narrow margin nearly smooth.

Riccia Michelii Raddi, var. *ciliaris* Levier (= *R. tumida* Lindenb. and *R. palmata* Lindenb. *fide* Levier) differs so widely from our species that a detailed comparison is unnecessary.

R. trichocarpa may be found with archegonia and antheridia in January and early February, ripening its capsules in April and May. Like all the Californian *Ricciae*, it is practically invisible during the summer months.

It was our first thought to take up for this species the name *Riccia Bolanderi* Aust., which a fragment (presumably from the Herbarium of the California Academy of Sciences) now in the Underwood Herbarium is said originally to have borne, and we have already sent one specimen to Europe under this name. But, in one of the very last of the acute Mr. Austin's works—his descriptive treatment of the Hepaticae of California, prepared for the "Botany of California,"* but never published—he refers this plant, which he had previously distributed as *R. tumida* Lindenb. (Hep. Bor-Am. no. 143[b]) to *R. intumescens*, raising Bischoff's variety of *R. ciliata* to specific rank, and without making any allusion to having at some time made use of an unpublished name, *R. Bolanderi*, for the same thing. This reference to *R. intumescens* would appear to have been Mr. Austin's final opinion in the matter, and under the circumstances it seems to us to be fairer to assume the responsibility of the attempt at disentangling this Californian *Riccia* from its various allies and to give it a name of our own choosing.

Hep. Am. 138, collected in San Mateo Co. by Prof. D. H. Campbell, we consider the type of the species.

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*Brewer, Watson, and Gray, Botany of California (Geological Survey of California), 2 vols. 1880.

RICCIA LAMELLOSA Raddi, Opusc. scient. di Bol. **2**: 351. *pl. 15. f. 2.* 1818.

Var. AMERICANA. Spores brown, 75–126 μ in maximum diameter, obscurely angular, wholly destitute of a wing-margin, with 8–12 clearly defined areolae, each about 15 μ in width, across the outer face, the inner faces marked with much smaller and less distinct areolae or simply with irregular vermicular lines.

California: San Francisco (Bolander, Howe); Fruit Vale, Alameda Co. (Miss Edith S. Byxbee). *New Jersey:* Closter (Austin). *Alabama:* Mobile (Mohr).

The principal peculiarity of the spore of the American *R. lamellosa* was first remarked upon by Professor Underwood (Bot. Gaz. **19**: 274. 1894). The European plant has distinctly wing-margined and plainly angular spores, and the markings of the inner and outer faces are nearly uniform; the ridges of the outer face are more vermicular than in the var. *Americana* and less often form perfect areolae, and when the areolae are well defined, they are smaller and more numerous, 14 or 15 measuring the diameter of the outer face. For comparison we have made use of a specimen from Florence, Italy (the type locality), and one from Sicily, both kindly communicated by Dr. E. Levier.

The Alabama and New Jersey specimens show practically the same characters as the Californian with the exception that the spores of the latter are larger, ranging from 90–126 μ in greatest diameter, while in the eastern and southern plants they measure but 75–100 μ. The Californian plant appears to produce capsules rather sparingly.

ASTERELLA LATERALIS.*

Thallus simple, or innovating latero-ventrally or in front, mostly oblong to linear, 7–25 mm. × 1.5–4 mm., rather effusely costate-carinate, about 25 cells thick in the middle, becoming very thin at the broad, brownish or decolorate and subpellucid, lightly undulate-crenulate margins, somewhat flatly and narrowly

* In accordance with the later practice of Lindberg and others, we use *Asterella* (Pal. de Beauv., 1810) for the genus to which Nees in 1820 gave the name *Fimbriaria*. *Asterella*, as has been recently pointed out by Professor Underwood (Bot. Gaz. **20**: 59. 1895), is the name of this group, whether by the "method of residues" or by application to the first species cited under it by its author.

crescentic in cross-section when moist, rigid and canaliculate or subconvolute on drying, dark-purple beneath, very obscurely areolate and porose above, solid in texture, the air-chambers almost wholly filled by secondary walls; scales small, purple, in a single series on either side of the costa, reniform or ovate, the anterior abruptly narrowed to a lanceolate or filiform reddish-purple point, which very rarely exceeds the apical margin: monoicous: androecia and ♀ branches on small latero-ventral innovations, those bearing a ♀ branch expanded, emarginate, bilobed or somewhat obcordate, 2–3 mm. long, 1–2.5 mm. in maximum width, with filiform-pointed inflexed scales at apex, androecium-bearing innovations smaller, scarcely expanded distally: ♀ receptacle subhemispherical, lightly papulose, becoming nearly smooth, 2–2.5 mm. in maximum width, with distinct and finally divergent lobes, maturing 1–4 (commonly 2 or 3) sporogonia, pilose-barbate beneath; pseudoperianth white, the exserted portion conical or conical-oblong, about 8-cleft, the segments often free with age; peduncle pale straw-colored, 1–1.5 cm. high, pilose at first, becoming naked: capsule circumscissile near the middle; spores brown, opaque, 75–90 μ, very minutely granulose papillate, the angles with a narrow concolorous margin, the faces exhibiting a few low ridges, these often uniting to form 2–4 shallow rather irregular areolae across each face, the more mature and opaque spores appearing simply warty-rugose in outline or subentire; elaters brown, 140–220 μ long, 15–21 μ in greatest width, bispiral, obtuse, occasionally branched.

Colomas, State of Sinaloa, Mexico (alt. 3000 ft.), (Dr. J. N. Rose, July 18, 1897); also, plants with quite immature sporogonia, by the same collector, in the Sierra Madre at Tepic, Mexico, Aug. 1897.

Asterella lateralis is an ally of *A. Bolanderi* (Aust.) Underw., but differs in the somewhat smaller ♀ receptacle, in the usually 8-cleft instead of 10–12-cleft pseudoperianth, and very markedly in the character of the spores and elaters—the spores of *A. Bolanderi* being deeply alveolate-areolate (4–6 meshes across each face) with a conspicuous pellucid margin, the elaters being 200–250 μ long and only 8–10 μ in width. As in *A. Bolanderi*, a tendency to dioicism is observed.

The only other species of *Asterella* with androecia and ♀ branches on small postical innovations known to us, outside of the American *A. Bolanderi* and *A. violacea*, are two species from

Africa, *Asterella linearis* (Steph.)* and *Asterella Preussii* (Schiffn.)† and one from Persia, *Asterella Persica* (Steph.),‡ which all differ (judging from descriptions alone) in being dioicous, while *A. Persica* evidently has a thicker thallus, being described as subsemicircular in transverse section, its scales are more prominent, the carpocephalum is 5–6-locular, etc.; *A. linearis* has geminately appendiculate scales, a highly papulose capitulum, and an almost fusiform pseudoperianth; and *A. Preussii* has scales attenuate at the apex into a very long hyaline seta, thicker thallus margins, a purple peduncle 25–30 mm. long, etc. The spores and elaters of these three exotic species are undescribed. The color and markings of the spores in this genus afford valuable characters, in the American forms, at least, for distinguishing species and these particulars have commonly failed to receive the attention that they deserve at the hands of authors. Spores that are nearly opaque in water often show the surface-sculpturing very clearly on examination in glycerine.

Explanation of Plates.

PLATE 336. *Scapania* (?) *heterophylla*. M. A. Howe.

1. An entire plant, ½ the natural size.

2 and 3. Opposite views of a portion of the stem, showing the often three-ranked leaves, × 15.

4. Dorsal view of stem and leaves, × 15.

5. Ventral view of the same object, showing an unlobed underleaf, × 15.

6. The leaf with lobes "a" and "a¹" already shown in figures 4 and 5.

7. A typical underleaf, × 15.

8. Outline of a deeply lobed leaf, × 15.

9. Apex of a branch of the same plant from which figures 4 and 5 were drawn; leaves here distichous, × 15.

10. The leaf "d" from the foregoing, × 15.

11. Ventral view of a leaf, × 15.

12. Cells from near base of leaf, × 244.

13. Cells from the apical margin of one of the upper leaves, × 244.

14. Paraphyses from axils of leaves, × 244.

15. Cross section of the stem, × 32.

PLATE 337. *Riccia trichocarpa*. M. A. Howe.

1 and 2. Portions of the plant, natural size.

3. Terminal segments of a young thallus, dorsal view, × 5.

4. End of a thallus lobe from fig. 1, with ostioles and a sporogonium, × 10.

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* *Fimbriaria linearis* Steph. Engler's Bot. Jahrb. **20**: 302. 1895.

† *Fimbriaria Preussii* Schiffn. Steph. *l. c.* 303.

‡ *Fimbriaria Persica* Steph. Hedwigia, **33**: 7. 1894.

5. Lateral view toward apex of a thallus-segment, showing the numerous trichomes, × 20.

6. Marginal trichomes, × 53.

7. Portions of thallus exhibiting the trichome-bearing elevations above the capsules, × 20.

8–13. Outlines of transverse sections about 10 μ in thickness at selected points from near the apex to the old and shriveled base, × 23. The trichomes do not appear so abundant as might be expected from the material used for microtome sectioning, which may be explained by the thinness of the sections and by the fact that the detached sections and fragments of the trichomes have not always adhered to the glass slides. Fig. 8 shows small median scales.

14. Epidermis and subjacent cells from a younger portion of the thallus, × 225. The superficial layer is here represented as composed of collapsed cells. In the extreme apical region only they are papilliform.

15. Epidermis in older parts of the thallus, × 225. The collapse and disintegration of the cells of the outer layer is so complete that only a structureless cellulose film remains.

16. Cross-section of thallus showing the cell structure and a young sporogonium, × 53.

17. Spores, × 305.

Figs. 1, 2, 4–7 and 17 from Hep. Am. no. 138 collected in San Mateo County, California, April, 1892, by Prof. D. H. Campbell; figs. 3 and 8–16 from material fixed with 1 per cent. chromic acid and preserved in alcohol, collected by the author near Berkeley, California, February 8, 1896.

New Plants from Western North America.—I.

By A. A. Heller.

(Plates 338–340.)

The following species, with one exception, were collected by Mrs. Heller and myself, either in Nez Perces county, Idaho, during the season of 1896, or in New Mexico, in the vicinity of Santa Fé, in 1897. Besides these, a number of others, still undescribed, have been distributed, and it is now the intention to publish them as speedily as possible. The type specimens of all new species described in these papers, are deposited in the herbarium of the University of Minnesota. The drawings for the illustrations were made by Mrs. Heller.

Calypso occidentalis (Holzinger)

Calypso bulbosa forma *occidentalis* Holzinger, Cont. U. S. Nat. Herb. **3**: 251. 1895.

This western plant is very similar to the eastern *C. bulbosa*, but differs in several points which seem to be constant. The color of the bunch of hairs on the lip is white, instead of yellow. These hairs also appear to be less numerous, straighter, and more slender. The lip also is usually longer, and more slender in proportion. So far as I have been able to ascertain, there is no record of specimens with yellow hairs from any point west of the Rocky mountains. The fact that these hairs are longer and fewer, is also noted in an account of certain Californian plants.* The plant is certainly as worthy of specific rank as many species now recognized by all, and is distinct geographically.

Collected in deep, damp woods, along the Sweetwater, and on the Craig mountain plateau, Nez Perces county, Idaho, June to July, 1896, no. 3185. It is the same as no. 211 of Sandberg, MacDougal and Heller, collected at the same place on the Sweetwater, in 1892, which is the type locality. It has been collected at different places in Idaho, Oregon, Washington and California.

* Erythea, **4**: 104. 1896.

FRAGARIA BRACTEATA.

Plant spreading, moderately stout, pubescent; rootstalk stout, basal bracts broadly lanceolate, acuminate, tinged with red; mature plant about 15 cm. tall, the flower stalks one-third longer than the leaves; pubescence of flower stalks and petioles floccose, spreading: leaflets obtuse, strongly serrate, the serratures gland tipped; lateral leaflets ovate, oblique on the inside, shorter than the terminal one; terminal leaflets broadly ovate, with cuneate base, 3.5 cm. long: pedicels about 3 cm. long, usually recurved, the lower and sometimes the next succeeding one subtended by a reduced leaf, the others by a simple bract; calyx-lobes nearly 1 cm. long, ovate-lanceolate, long acuminate; calcyine bracts lanceolate, half the length of the calyx; petals white, slightly longer than the calyx, broadly obovate: fruit ovoid, rather small, the seeds superficial. (Pl. 339.)

The type is no. 3615, collected in a meadow along Santa Fe creek, nine miles east of Santa Fe, May 29, 1897, altitude 8000 feet. Starved forms were also collected in damp places on the ridges near Santa Fé. It is probably the same as Fendler's 207, called *Fragaria vesca* by Gray. The pubescence on the leaflets and calyx-lobes is not so plentiful as it is on the stems, and is appressed.

To this well-marked species is referred no. 3279, collected by Mrs. Heller and myself in the vicinity of Lake Waha, Idaho, June 20, 1896, distributed as *F. Americana*, which species it does not very much resemble.

The figure represents a plant three-fourths natural size, and a seed magnified eight times.

HOLODISCUS AUSTRALIS.

A bush 2–3 meters high, growing in clumps; bark covered with gray scales; branches ascending, spreading above, the growing parts reddish, pubescent: mature leaves pale green, about 3 cm. long, 1–1.5 cm. wide, elliptical or elliptical-obovate, with cuneate base, which is prolonged into a short, slightly winged petiole, coarsely dentate, with spreading teeth, these tipped with a minute callosity, and nearly glabrous above, where the veins are deeply impressed, densely white wooly beneath: panicles wooly, many-flowered, terminal, drooping, about 10 cm. long, compound below, simple above: flowers creamy white, 4 mm. in diameter, on pedicels 4 mm. long, subtended by three short, linear or linear-

lanceolate bracts; calyx deeply five-cleft, the lobes ovate-lanceolate; corolla-lobes ovate, concave, thin, veined, very little longer than the calyx; stamens 20, perigynous, three opposite each calyx-lobe, and one opposite each petal, slightly longer than the corolla; styles five, distinct; ovaries woolly. (Pl. 338.)

The type is no. 3840, collected in Santa Fé cañon, nine miles east of Santa Fé, July 12, 1897, altitude 8000 feet. The specimens were taken from bushes which grew some three or four hundred feet up the slope from the stream bed, among basalt rocks, their near neighbors being an occasional pine tree, and scattered bushes of various kinds. The graceful, drooping habit of the panicles cannot be well shown in dried specimens.

The drawing represents a branch one-half natural size; figure 1, a leaf natural size; figure 2, a flower magnified four times; 3, a stamen magnified 7 times, and 4, a pistil magnified 10 times.

Rusby's no. 121, collected on "high summits of Mogollon Mts. N. Mex., Sept. 7, 1881," and labelled "*Spiraea discolor* Pursh, var. *ariaefolia* Wats.," belongs with *H. australis*. It has also been confused with "*Spiraea dumosa*," but is very unlike that species, the type of which is preserved in the herbarium of Columbia University. Its nearest relative is *H. discolor*, a plant of the northwest, the type of which was collected by Lewis "on the banks of the Kooskoosky," Idaho.

GERANIUM ATROPURPUREUM.

Geranium caespitosum A. Gray, Mem. Am. Acad. (II) **4**: 25. 1849. Not James.

Perennial; stalks numerous, 10–30 cm. long, matted together, procumbent or somewhat ascending, divaricately branched, sharply angled and channeled, retrorsely pubescent: stipules lanceolate or triangular-lanceolate, long-acuminate, the lower and broader ones nearly 1 cm. long; leaves orbicular in outline, about 4 cm. in diameter, the basal ones five-parted, those of the stem three-parted, the lateral segments of these again deeply lobed, so as to give them the appearance of being five-parted, the segments all incisely lobed: peduncles slender, 10–12 cm. long, two-flowered, the pedicel of the outer flower 2 cm. long, that of the inner flower a third shorter; sepals 1 cm. long, elliptical-oblong, three-nerved, scarious-margined, tipped with a prominent cusp, pubescent with short, appressed hairs, or sometimes little more than puberulent;

corolla deep rose-purple throughout, the lobes obovate, slightly longer than the calyx, the lower half bearded with straight, white hairs, as is also the lower part of the filament; ovary pubescent; styles 5 mm. long, recurved, spreading in flower.

The description is drawn from our no. 2723, collected along Santa Fé Creek, June to July, 1897. It is very plentiful along the stream, but always in dry ground. It has a range of about 2000 feet, as it was first collected four miles east of Santa Fé, at an elevation of a little over 7000 feet, but later was seen growing on a slope ten miles up the valley, and at an elevation of almost 9000 feet. It was also noticed along the road between Santa Fé and Cañoncito.

This species was described by Gray as long ago as 1849, but he unfortunately referred it to James' plant, and in doing so ran counter to the good judgment of Engelmann. He says: "Dr. Engelmann has indicated it as a new species, but I am so confident that it is the species noticed and imperfectly characterized by Dr. James that I venture to revive his name, which, unless thus identified, must ever remain appended to the genus as a doubtful species, since no specimens of it exist in the collection made by him in Long's expedition."

Why he was "so confident" that he had James' species in hand is not so apparent when one knows the facts, but the citation of "*G. caespitosum* James in Long's Exped. 2. *p.* 3, ex char. et loco natali," seems very conclusive to one who is not in possession of the facts. However, our plant is not the same as James' "ex char." and it is very far from "loco natali." James' description reads as follows: "Sub-erect, pubescent, sparingly branched above. Radical leaves reniform, deeply 5–7-cleft. The flower is a little larger than that of *G. Robertianum* and similarly colored, having whitish lines towards the base of the corolla."

Although the above description is meagre and unsatisfactory, it indicates a plant of different habit and with a corolla of a different color. Whatever points of coincidence there may be between the two plants, there certainly is none in the "loco natali." Part of the Long expedition actually did go as far south as New Mexico, skirting the eastern base of the Rocky mountains, but James was not with this party, and did not go further south than Pike's Peak.

The "Account of an Expedition from Pittsburgh to the Rocky Mountains," under the command of Lieutenant Long, written by Dr. James, is very interesting reading, and there can be no mistaking the approximate locality where he obtained his "*Geranium caespitose*," as it is spelled in the original. In the latter part of volume I. we find an account of their progress up the Platte to and beyond the confluence of the two branches, and their eagerness to ascend the mountains. Finally, having arrived at the foothills, the following account is given:

"The woodless plain is terminated by a range of naked and almost perpendicular rocks, visible at a distance of several miles and resembling a vast wall, parallel to the base of the mountains. These rocks are sandstone, similar in composition and character to that on the Cannon Ball creek. They emerge at a great angle of inclination from beneath the alluvial of the plain, and rise abruptly to an elevation of one hundred and fifty, or two hundred feet. Passing within this first range, we found a narrow valley, separating it from a second ridge of sandstone of nearly equal elevation, and apparently resting against the base of a high primitive hill beyond." At this place, "about the sandstone ledges," is where he collected his *Geranium*, either in what is now the State of Nebraska, or, at most, in extreme northeastern Colorado.

Dr. Trelease, in Mem. Bost. Soc. Nat. Hist. **4**: 75, touched upon this matter, where he says: "There is reason to doubt whether James' plant is not really the preceding (*G. Fremonti*), for he did not collect south of Pike's Peak, while this species, as I understand it, is distinctively southern."

Our plant, so far as I have been able to ascertain, does not occur outside of New Mexico and Arizona, although specimens from several other States, but belonging to some other species, have been referred to it. All the evidence seems to indicate that the real *Geranium caespitosum* is the plant now known as *Geranium Fremonti*, at least so far as applies to the plant collected by Fremont. What Fendler's specimens from "bottom lands of the Mora river," and Lieutenant Abert's from the "Raton Mountains" may be, I do not know, but they are hardly the same as Fremont's specimens, and apparently different from *G. atropurpureum*.

GERANIUM TEXANUM (Trelease)

Geranium Carolinianum var. *Texanum* Trelease, Mem. Bost. Soc. Nat. Hist. **4**: 76. 1887.

Annual; spreading and somewhat ascending, branched from the base and also above, rather stout, 20 cm. high, pubescent with short, appressed white hairs, which point downward: leaves light green, of firm texture, the lower ones on petioles 6–8 cm. long, almost orbicular in outline with rounded sinus, 3 cm. in diameter, three-parted and these divisions again three-lobed, except the lateral or basal ones, the divisions generally oblong, rounded; upper leaves essentially the same, except that the smaller upper ones are more irregular, all appearing as if glabrous to the naked eye, but more or less pubescent with appressed, ascending hairs, especially on the veins and margins: peduncles slender, two-flowered, the lower ones 2 cm. long, the upper ones barely half that length; pedicels slender, 5–8 mm. long; sepals orbicular-ovate, 4 mm. long, 3 mm. wide, three-nerved, one central and prolonged into a prominent cusp, the other two marginal, and marked with a line of hairs; flowers white with a faint purple tinge, the petals entire, oblong or at most obovate-oblong, slightly exceeding the calyx, three-nerved, the veins anastomosing at the top so as to form an open loop; ovary-lobes pubescent with long, scattered hairs; beak slightly over 1 cm. long, short-pointed, hispid with short, ascending hairs: seed ovoid, finely and closely pitted.

Some time ago, while looking over the specimens in the *Geranium Carolinianum* cover at the herbarium of Columbia University, I came across my own no. 1510, collected at Corpus Christi, Texas, in 1894, and at once noticed its dissimilarity to specimens from the Atlantic region. Prof. Trelease kindly loaned me the type specimens of his *Geranium Carolinianum Texanum* for comparison, and I learned that my specimens were identical with his, and quite typical. The specimen from which the above description is drawn is in the Columbia herbarium. The types, which were collected by Lindheimer, near New Braunfels in 1848, are more mature, showing fruit only. My specimens were collected March 27, 1894, in the sandy bed of an "arroyo," a short distance southeast of Corpus Christi, and distributed as *Geranium Carolinianum*. Although related to that species, *G. Texanum* differs in being lower, of a more diffuse habit, the pubescence is of a different nature, the calyx-lobes are broader and

shorter, and the petals narrower, not notched, and of a different shape. The leaves also are of a more coriaceous texture.

MENTZELIA PARVIFLORA.

Annual; stems weak, ascending, about 4 dm. high when mature, branching throughout, whitish, shining, sparsely pubescent with short, spreading hairs, or merely glandular puberulent below, leafy, especially above: leaves sessile, the lower oblong, 3–5 cm. long, 5 mm. or slightly more in width, rounded or acutish, the upper ones lanceolate, acute, 2–3 cm. long, less deeply lobed, or some entire, one nerved: flowers axillary, sessile, the lower ones solitary, those higher up often in pairs, and the terminal ones in threes, of these the lateral ones on short branches, thus forming a corymbose cluster, but each individual flower sessile, and subtended by reduced leaves, except the middle one, which is naked; calyx-tube cylindrical, 1.5 cm. long when fully developed, 2 mm. in diameter, pubescent with spreading hairs, which are longer and more plentiful than those on the stems; lobes of the calyx linear-lanceolate, 2 mm. long, pale; corolla expanding in sunshine, pale yellow, spreading, the lobes broadly obovate-spatulate, slightly more than 3 mm. long, and 2 mm. wide at the top, emarginate, veined; stamens shorter than the petals, the filaments all filiform: seeds about 30, in a single series on each placenta, slightly tuberculate scabrous, more or less cubical.

The type is no. 3750, collected eleven miles southeast of Santa Fé, New Mexico, on the road leading to Cañoncito, June 23, 1897, at an elevation of about 7200 feet. The specimens were growing near the roadside, in a day ravine, where they were partly shaded by bushes. Young plants were more simple, and less weak than the older ones, which often grew in clusters, and were somewhat interlaced. In a general way this species is related to *M. albicaulis*, and specimens of it may exist in herbaria under that name, but the flowers are much smaller, in addition to various other differences.

BOISDUVALIA PARVIFLORA.

Small, barely 15 cm. high, branching below, the branches spreading, whole plant pubescent, the hairs white, spreading; lower parts of stem and branches yellowish, and not so densely pubescent as the upper, leafy throughout: leaves lanceolate, the longest about 2.5 cm. long, somewhat narrowed at the sessile base, sparingly glandular, serrate or entire, tipped with a very short cusp,

midvein prominent: sepals lanceolate, barely 2 mm. long; the flowers solitary in the axil of nearly every leaf; petals pale red, half again as long as the sepals, obovate-spatulate in shape, two-cleft; mature pods about 7 mm. long, slightly curved outward.

The type is no. 3411, collected July 10, 1896, on the bare, dry ridge east of Lake Waha, Nez Perces county, Idaho, altitude 2500 feet. The plants were growing in dry stony ground. It appears to be a species quite distinct from any hitherto described, although it may have a relative in *B. diffusa* Greene, from near Deeth, Nevada. That species is of different habit, however, and less pubescent.

ERIGERON PULCHERRIMUS.

Perennial, from a stout, multicipital rootstock; stems and foliage light green: stems about 20 cm. high, tufted at the base with young leaves and the remains of the old ones, simple, slender, leafy for three-fourths of their length, marked with prominent yellowish lines, pubescent with short, appressed, white hairs, which point upward: leaves all very narrow, about 1 mm. wide, the basal ones linear-spatulate, about 1.5 cm. long, those of the stem 2–4 cm. long, linear, acute, pubescent in the same manner as the stems: peduncles a prolongation of the stems, 2–5 cm. long: heads large, 3.5 cm. in diameter, 7 mm. high; involucral bracts in about four rows, slightly spreading, linear-lanceolate, more or less tinged with red, especially the tips, pubescence spreading; rays 20–30, either white, pinkish, or violet blue, 1.5 cm. long, 2 mm. wide, emarginate. (Pl. 340.)

The type is no. 3664, collected on sandy hills ten miles north of Santa Fé, New Mexico, June 5, 1897, at an elevation of 5800 feet. In the type specimen, the rays are violet blue, but some of the other specimens have pinkish, or even white rays. It is gregarious in habit, and is one of our handsomest species. Its nearest relative appears to be *E. Montanensis* (*E. Tweedyanus*), but it is much less pubescent than that species, the pubescence being appressed instead of spreading, the involucral bracts are longer, more acute, smoother, and the rays are longer and broader. The drawing shows the plant one-half natural size, with a ray flower and disk flower, each natural size.

HYMENOPAPPUS ARENOSUS.

Stems several, clustered and united below, from an apparently

perennial root 25–30 cm. high, leafy, branching, floccose-tomentose throughout, especially below: leaves light green, thrice, or the upper ones only twice pinnately divided, the divisions all narrowly linear, from .5–2 cm. long, barely 1 mm. broad; basal leaves about 10 cm. long, including a petiole of 5 cm., those of the stems sessile, or the lower one petioled, one springing from the base of each branch, and about the length of the internode which it subtends: heads corymbosely cymose, on rather long, stoutish peduncles (2–6 cm. long), 1 cm. high; flowers bright yellow; bracts of the involucre obovate-oblong, the margins thin, whitish, the middle part green, more or less covered with floccose tomentum, especially at the base; corollas 5 mm. long, the tube occupying nearly half the length, the throat cylindrical rather than campanulate, the triangular-lanceolate lobes little more than one-fourth the length of the throat; akenes villous with rather long hairs; palae of the pappus oblong, or slightly contracted below, a little longer than the corolla-tube.

The type is no. 3542, collected near Española, Santa Fé County, New Mexico, May 17, 1897, at an elevation of 5600 feet. The specimens were growing on the right bank of the Rio Grande, about three miles below Española, in almost pure sand. Later, more of them were noticed on the sand hills at the point where the railroad turns away from the river. It falls into the same group to which *H. flavescens* belongs, but is evidently different. It apparently grows only at elevations under 6000 feet, and at no place was it seen growing in company with *H. luteus* Nutt., which is a perfectly valid species, not at all like any of the so-called forms of *H. filifolius*. *H. luteus* is common on the hills about Santa Fé, growing at an elevation of 7000 feet and more.

UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MINN.

New Plants from Wyoming.—I.

By Aven Nelson.

(Plate 341.)

In my work in the Red Desert of Wyoming during part of the season of 1897 a number of rather unusual and interesting plant forms were secured and some plant ranges were greatly extended. To me one of the most interesting finds was a perfectly yellow flowered *Oreocarya*, which may be described as follows:

Oreocarya flava.

Perennial, tufted from a branched, lignescent caudex, 1–2.5 dm. high: stems numerous, simple, white pubescent below, fulvously hirsute upwards: leaves numerous, basal ones scale-like and densely white hirsute, lower stem leaves somewhat crowded, linear to narowly oblanceolate-petiolate, appressed pubescent or hirtellous, upper leaves slightly broader with broader base, 3–5 cm. long: inflorescence crowded, glomerate spicate; calyx yellow-hirsute, lobes linear, half the length of the corolla-tube; corolla a decided yellow, tube about 12 mm. long, lobes suborbicular, 3–4 mm. in diameter, crests conspicuous, emarginate; essential organs strikingly dimorphic; stamens inserted just below the throat or just below the middle of the tube, anthers linear; style the length of the tube or half the length; mature nutlets not seen but seemingly smooth, ovate, one or more sometimes smaller and possibly not maturing.

A remarkably distinct species, not comparable to any form known to the writer. *Krynitzkia leucophaea* Gray may be suggested by it but from that it is more than distinct. In the possession of decidedly yellow flowers it probably stands alone. A beautiful and striking plant as observed on the otherwise often naked hillsides in the Red Desert. Two collections were secured June 1, 1897, one at Point of Rocks, the other at Bitter Creek Station. These differ in that all the specimens in one have long stamens, and in the other they are all short.

Type specimen in Herb. Univ. of Wyoming, no. 3074.

In recent years there has been much seeking after plants that

would thrive in soil heavily impregnated with alkali. A number of imported species have been highly recommended and have been tried with varying success. Since those that give greatest promise are species of *Atriplex* it is interesting to find some native species in this genus that look as if they might prove profitable, or at least worthy of trial. These species, one a perennial and the other an annual, both inhabit saline basins or banks even to places actually encrusted with the prevailing salt. They may be named and described as follows:

ATRIPLEX PABULARIS.

Dioecious, perennial, persisting by the very short woody base which branches freely at or just above the surface of the ground; the annual branches numerous and somewhat fascicled, strict and usually but slightly branched, 2–5 dm. high; entire plant with closely appressed white scurf: leaves oblong to almost linear, obtuse, cuneate at base, sessile or very short-petioled, 1–5 dm. long, 1–12 mm. broad: staminate panicle leafy, dense and short (5–15 cm.): pistillate panicle leafy, dense and long (more than half the length of the stem): fruit uniformly triangular-cuneate, decidedly compressed, 4–5 mm. long, almost as broad at summit: bracts united, marginless, the somewhat truncate summit three-toothed, the middle one slightly longer and the lateral ones bearing an inconspicuous rudimentary one; the teeth of the otherwise closely appressed bracts slightly divergent, their sides perfectly smooth, *i. e.*, not crested nor muricate.

From the Desert of Wyoming where it is found in abundance on the highly saline soil of the low flats immediately adjacent to such streams as Bitter Creek and Salt-Wells Creek. It endures the strongest alkali soil, making a dense growth and a large amount of forage which is highly prized as sheep fodder.

In general appearance it most resembles *A. Nuttallii* S. Wats., but is easily distinguished by its less woody base, its denser growth, its more strictly erect habit, its habitat and especially by the very distinct character of its fruiting bracts.

Numbers 3712 and 4429 from Point of Rocks, Wyo., 1897.

ATRIPLEX VOLUTANS.

Annual, silvery-scurfy throughout, divaricately and most intricately branched; branches ascending; the plant at maturity a

compact, sub-spherical mass from two-thirds to more than a meter in diameter: tap-root single, slender, brittle at maturity when the plant becomes a "tumble-weed:" leaves comparatively thin, variable in shape, from broadly lanceolate to triangular, rarely subhastate or broadly cuneate at base, sometimes irregularly dentate, acute, obtuse or even toothed at apex, sessile or subsessile, 2–5 cm. long: pistillate flowers in axillary clusters: fruiting bracts pedicelled, indurated, united only to the foliaceous margin, irregularly sub-orbicular, 7–14 mm. wide, free margins variously toothed or lobed, the lobes of the opposing bracts not coinciding, the upper lateral usually larger; sides usually appendaged or often only one side giving a triangular appearance to the fruit, appendages frequently somewhat foliaceous and conspicuous; radicle superior. (Pl. 341.)

The species is more nearly related to *A. argentea* Nutt. than any other with which I am acquainted, and possibly has been confused with it. It may be distinguished from *A. argentea* by its habit and size and by its branching bracts. To confuse herbarium specimens of the two would not be difficult, but specimens in the field, never.

So far as my observation goes it is very local. I have observed it for several years past only in a large alkali basin on the Laramie Plains. It is very abundant on the low flats adjacent to some alkali lakes. It grows rapidly, matures in September, and by October most of the plants are free and rolling. I have seen it windrowed against the wire fences to more than the height of the fence, so that the later comers tumbled over and passed on to lodge in some ravine or against the next fence on the route.

The accompanying half-tone plate shows a characteristic specimen with a meter stick lying upon it, and is not unusual as regards size.

Type specimen in Herb. Univ. of Wyoming, no. 2796.

LUPINUS HUMICOLA.

Perrennial; rootstock branched, the low crowns covered with the scale-like dead petioles: stems several from each crown, simple, erect or ascending, 3–6 dm. high; finely but not densely appressed-pubescent throughout: leaflets 7–12, usually 10 or 11, oblong-oblanceolate, cuspidate-acute, 4–7 cm. long: petioles slender, elongated, radical 1.5–3 dm., cauline gradually shortened upward: stipules linear-lanceolate, villous: racemes terminal,

dense, 1–2 dm. long, elongating in fruit: flowers blue, sub-verticillate, standard glabrous; bracts minute or wanting; pedicels 5–8 mm. long, stout in fruit: pods villous-pubescent, 2.5–4 cm. long, normally 6-seeded.

A good species, possibly somewhat local; abundant in the Laramie hills, where it has several times been collected and frequently observed. It has not been secured elsewhere in the State. It loves a moist soil, rich in humus; is not found on the open plain but in aspen or other thickets or even among sage-brush on the slopes where snowdrifts accumulate and lie late in the spring. It develops early, almost out of the snow-drifts, and begins to show its spikes of blue even before the aspens are in leaf.

Heretofore carelessly confused with *L. leucophyllus* Dougl. under which name I have distributed it as no. 151.

Type specimens in Herb. Univ. of Wyoming, no. 151, Laramie Hills, June 2, 1894, and no. 71, a well-fruited specimen from the same locality by Mr. Elias Nelson, who first called my attention to the marked differences between these specimens and *L. leucophyllus*.

LESQUERELLA CURVIPES.

Perennial: stems tufted on the expanded crown of the single, long, slender, woody root, numerous (30–60), nearly simple, spreading-assurgent, 1½–3 dm. long; finely stellate pubescent throughout: leaves entire, cauline, linear to oblanceolate, tapering gradually into the somewhat margined petiole, 3–6 cm. in length, radical oblanceolate to obovate with margined petioles: flowers unknown: pods ovate, acute, distinctly compressed at summit, gibbously convex towards the base, about 8 mm. long, the slender style two-thirds as long: slender pedicels divaricate, 1–2 cm. long, doubly curved, the proximal part upward, the distal downward with ascending tip bearing the erect pod: seeds two in each cell, rarely one or three.

It most resembles *L. montana* Nutt. from which it differs in its larger size, more numerous stems, its somewhat veiny leaves, larger, compressed pod and fewer seeds.

Collected in the northern Big Horn Mountains, on the Dome Lake road, at about 9000 ft., July 19, 1896, no. 2424.

LESQUERELLA ROSULATA.

Annual, or possibly more enduring, finely stellate pubescent throughout: stems few, 1–2 dm. long, ascending, floriferous one-

half their length: leaves mostly radical, forming a compact rosulate cluster on the crown of the short tap-root, outer ones large, blade 3 cm. long on petioles 3–6 cm., diminishing in size and length of petiole towards the center, oval to oblong, entire or tooth-angled, some of the smaller sub-hastate, cauline only one or two, oblong, 2–3 cm., petioled: pods oval to elliptic, sub-acute or more usually obtuse, 5–6 mm. long, slender style as long or longer: pedicels ascending, curved, about 1 cm. long.

Perhaps most closely allied to *L. montana* Wats. by its fruit, but separated from it by its conspicuous rosette of basal leaves, its fewer stems, its few, long-petioled cauline leaves, its smaller pod and its later development. *L. montana* matures its fruit in June; this species in late August.

Centennial Valley, on loose sandy soil, August 18, 1896.

A new Atriplex.

By George E. Osterhout.

Growing in the saline soil of the elevated table-lands of Colorado and Wyoming is a small shrubby *Atriplex*, which appears to be undescribed, and to which I assign the name

Atriplex fruticulosa.

A scurvy canescent decumbent shrubby perennial, 2–4 dm. in length, the ends of the branches ascending and the annual growths for the most part bearing the flowers and fruit. Leaves spatulate to oblanceolate, nearly sessile, obtuse or subacute at the apex, narrowed from above the middle to the base, 3–6 mm. wide by 1.5–3 cm. long, with many smaller leaves toward the base: flowers dioecious, both kinds in capitate clusters from the axils of the upper leaves: staminate branches often becoming spicate, and the flowers often brown in color, about 10 in a cluster: pistillate flowers green, and about 5 in a cluster; bracts of the pistillate flowers oblong, united to the top, 2 mm. wide by 3 mm. long; fruiting bracts oblong, 3–3.5 mm. wide by 5–6 mm. long, a little broader at the top, rounded at the base, usually 3-toothed at the apex, with the middle tooth largest; the sides are smooth and reticulated; radicle pointing upward.

The type was collected in July, 1896, near a small alkaline lake in southern Wyoming. Other plants which I collected in the same locality and in North Park, Colo., in September, 1897, are quite surely this species, but differ from the type in that the fruiting bracts are irregular, and some of them more or less muricate. On examination it was found that few of them had perfected seed, having suffered from the depredations of some insect, which probably accounts for the irregularity of the bracts. It was also collected by Mr. P. A. Rydberg near Green River, Wyoming, in July, 1895. I am indebted to Mr. Rydberg for comparing my specimens with those in the herbarium of Columbia University.

Some rare Washington Plants.—II.

By K. M. Wiegand.

In the July 1897, number of this journal the writer published a short list of rare plants collected by Mr. J. B. Fleet in various portions of the state of Washington. Since that time a large set of about two hundred numbers collected by the same person has been received. The collecting ground this time covered two distinct localities. The first, situated on the shores of Puget Sound, in the vicinity of Whidbey Island and Hadlock, Wash., was distinctly littoral in character. On the contrary, the other was alpine, located as it was near the summit of the Olympic Mountains, on the watershed between the Dungeness and Quilcene Rivers. As one might naturally expect, the rare plants in the Sound collection were few and mostly introduced. On the other hand and quite in contrast with this, the set from the mountains was unusually rich in forms that from their known distribution seem out of place. Those which from the literature at hand, seem to be rare or to extend the known range of the species are included in the following list.

Anemone multifida Poir. Grassy slopes near the summit of the Olympic Mountains. Alt. 6000 ft.

Delphinium glaucum Watson. Moist grassy places near the summit.

Delphinium bicolor Nutt. Dry grassy slopes near the summit.

Draba Lemmoni Watson. Rocky places near the summit.

Draba stenoloba Ledeb. Among stones and rocks, mountain summit.

Viola Howellii Gray. Shady places near Puget Sound.

Lewisia Columbiana (Howell) Robinson. Rocky ledges, summit.

Potentilla villosa Pall. Rocky ledges, Olympic Mts. Alt. 6000 ft.

Hippuris vulgaris L. Whidbey Island, Puget Sound.

Epilobium glaberrimum latifolium Barby. Moist grassy places, summit of the mountains.

Lonicera Utahensis Watson. Rocky ledges and ravines near the summit.

Galium trifidum subbiflorum Wiegand. Lake shores and pools about Puget Sound. Specimens previously examined showed the range of this variety west of the Rocky Mountains to extend no farther north than Oregon, but the numerous specimens in the present collection extend the range at least as far as Puget Sound; doubtless it grows still farther north.

Artemisia borealis Wormskioldii Bess. Rocks and loose stones, summit.

Sonchus arvensis L. Whidbey Island, Puget Sound.

Campanula scabrella Engelm. Rocks near the summit.

Gentiana acuta Michx. Hadlock, Wash.

Rhinanthus Crista-Galli L. Whidbey Island, Puget Sound.

Orthocarpus tenuifolius (Pursh) Benth. Rocky ledges near the mountain summit.

Abronia latifolia Esch. Whidbey Island.

Polygonum Austenae Greene. Grassy slopes near the summit.

Salix commutata Bebb. Moist grassy places, springs and streams near the summit. In flower July 27.

Allium cernuum Rothr. Rocky ridges and dry ground, summit.

Zygadenus elegans Pursh. Rocky ledges, summit; fine specimens; the obcordate glands, large flowers and broad sepals are very conspicuous.

Carex exsiccata pungens Bailey. Swamps about Puget Sound.

Carex nardina Fries. Loose rocks and gravel. Alt. 6000 ft.

Polypogon littorale Smith. Salt marshes, Puget Sound.

Aira Caryophyllea L. Prairies near Puget Sound.

Lycopodium lucidulum Michx. Snoqualmie, Cascade Mts.

CORNELL UNIVERSITY.

Notes on Maine Plants.

By F. L. Harvey.

The following notes may be of interest to botanists. The species are either new to the State or the localities are new. The grasses were examined by Mr. Scribner.

Brassica juncea (L.) Cosson.

Orono, July, 1896. Cultivated fields (Harvey).

Dianthus barbatus L.

Orono, July, 1896 (Harvey), E. Auburn, July, 1896 (E. D. Merrill). Growing in grassy places near gardens and maintaining itself from year to year.

Geranium Bicknellii Britton.

Common about Orono in rocky woods along roadsides, July, 1896 (Harvey). This species seems to be more common in Maine than *G. Carolinianum*, with which it has been confounded.

Agrimonia hirsuta Bick.

Auburn and Monmouth, July, 1896–7 (E. D. Merrill).

Spiraea filipendula L.

Machias, Me., Aug. 1897. Common along stone walls by the roadside (P. L. Ricker).

Rubus setosus Bigelow.

Auburn, July, 1896 (E. D. Merrill).

Chrysanthemum valsomita tanacetoides Boiss.

Roadsides and waste heaps, E. Auburn (E. D. Merrill). Escaped from gardens.

Lactuca graminifolia Mx.

There is a specimen of this species in the Blake Herbarium Univ. of Maine collected at N. Bridgton, Me., July 1873, by Rev. J. Blake.

AMARANTHUS BLITOIDES S. Watson.

Common in car-yards, Bangor, Me., July, 1895. (Harvey.) The plants are depauperate.

CUSCUTA EPITHYMUM Mun.

Common in clover fields, Bradley. (Harvey.) Parasitic on red clover.

CAREX MONILE MONSTROSA Bailey.

Bank of Stillwater River in low ground, Orono, July, 1896. (Harvey.) According to Britton this plant has only been found heretofore along the Concord River in Massachusetts.

CAREX BIGELOVII Britton.

Black Cap Mountain, Amherst, Aug. 1896. (Harvey.)

PANICUM IMPLICATUM Scribner.

We think this is a form that has been confounded until recently with *P. pubescens* Lam. and *P. lanuginosum* Ell. E. Auburn, 1896. (E. D. Merrill.)

PANICUM LINARIFOLIUM Scribner ined.

Orono, July, 1890. (Harvey & Briggs.) E. Auburn, June, 1896. (E. D. Merrill.) This form has been confounded with *P. depauperatum* Muhl. until recently.

PANICUM BOREALE Nash.

Chemo Stream, Bradley, July, 1891. (F. P. Briggs.) Monmouth, July, 1896. (E. D. Merrill.)

PANICUM MACROCARPON Torr.

Roadsides, E. Auburn, June, 1896.

PANICUM DICHOTOMUM ELATUM Vasey.

July, 1881, Wells. (Rev. J. Blake.) This forms occurs in the Blake Herbarium as *P. dichotomum* type.

AGROSTIS NOVAE-ANGLIAE Tuckerm.

There is a specimen of this species in the Blake Herb. of the University of Maine, collected by Rev. J. Blake, Aug., 1871, at Wells, Me., and incorrectly named *A. perennans*. This was found at E. Auburn in 1896 in low grass land by E. D. Merrill.

AGROPYRON REPENS GLAUCUM Scribner.

Common about gardens, Orono, 1895. (Harvey.)

Proceedings of the Club.

WEDNESDAY EVENING, JANUARY 26, 1898.

There were nineteen persons present with President Brown in the chair.

In accordance with notice given at the preceding meeting, the amendment to the Constitution proposed in December was called up and passed, changing the limit of associate editors of the BULLETIN to seven instead of five.

Mr. Marshall A. Howe was elected associate editor.

An invitation from Prof. F. E. Lloyd to meet at Teachers College on the first session in March was referred to the Committee on Program with power.

The first paper, "New Sapindaceae from South America," was by Dr. Radlkofer, of Munich, and presented by Prof. Burgess. It contained descriptions of species of *Urvillea*, *Serjania* and *Paullinia*, soon to be printed in the BULLETIN. Their type specimens were exhibited, forming part of a collection made by Dr. Rusby in South America.

The second paper, by Dr. J. K. Small, "The genus *Bumelia* in the Southern States," described the distinctive characters of thirteen species, five of which had been before recognized.

Discussion on specific limitation followed, President Brown, Dr. Britton, Dr. T. F. Allen, Dr. Small, Dr. Underwood, Prof. Lloyd and the Secretary participating.

Dr. Britton spoke of cultivation in the Botanical Garden at Bronx Park, as having already settled some questions of specific limits. Mr. Nash has in this way proved *Potentilla Canadensis* and *P. simplex* to be distinct, also the European *Pyrola rotundifolia* and the American species long known under this name.

The third paper was by Dr. N. L. Britton, "Remarks on some species of *Senecio*," with exhibition and discussion of illustrative specimens, and of several new species, soon to be printed. One species from White Sulphur Springs is one of three plants on

Kate's Mountain which find their nearest relatives on the Rockies 1500 miles distant.

Discussion followed on the respective value to be assigned to different characters. Dr. Britton held that absence of rays is an uncertain distinction in *Senecio* and that involucral characters are more permanent. The Secretary remarked on the failure of acheneal characters in *Aster*, and Dr. Britton upon the same in *Helianthus*.

Prof. Lloyd remarking that *a priori* we should expect to find greatest variation in organs like leaves which are in direct contact with their environment, Dr. Britton said that though leaves vary much in form, they vary but little in assimilation-tissue, their special character.

TUESDAY EVENING, FEBRUARY 8, 1898.

Twenty-seven persons were present, President Brown in the chair.

The program was devoted to the Asclepiadaceae or milkweed family.

The first paper was by Dr. H. H. Rusby, deseribing "A new Genus of Asclepiadaceae from Bolivia." Dr. Rusby discussed the tribal and generic characters of that family, and exhibited specimens of his new genus, which is a vine of vigorous growth and of peculiar pollinial position.

The second paper, by Miss Anna M. Vail, described a new species of *Acerates*, or green-milkweed, with comparisons of the other species already known. Specimens and illustrations were exhibited, with remarks upon the history of the genus from its earliest species, *A. Floridana*, onward. As distinctive characters of *Acerates*, she mentioned its aspect, its form of hood and its lack of strong horn-like characters. The characteristics were further discussed by Dr. Edward L. Greene, who was present from Washington, and who emphasized the importance of its axillary subsessile umbels and the green color in its flowers.

The varieties of *Acerates viridiflora* were then discussed, especially with reference to their great difference in leaf-form. Miss Vail finds their flowers to be identical. Mr. Rydberg re-

ported finding all four of these forms within one county of central Nebraska on the sandhills, but to the east the broader-leaf only, and in Western Nebraska a narrow-leaf variety only.

General discussion on the Asclepiadaceae followed, participated in by Prof. Greene, Dr. Britton, Dr. Rusby and others. Miss Vail, in answer to inquiries, indicated the difficulties in the way of regarding the horn in that genus as a midrib. It is very variable, often double, differs in character from the still persistent midrib of the same hood, and in many western species is replaced by a broad triangular lamina.

Miss Vail described her results when watching plants of *Asclepias Cornuti* last summer. Bees and many small insects directed themselves at once to the glutinous top of the anther-column. They seemed to neglect the corona, and but little secretion was apparent in it, instead of the copious deposits of honey expected.

Prof. Greene queried if the corona in this family might not prove to be the true corolla, and cited the Malvaceae as similar in adhesion of the corolla to the stamen-tube. He said, I would exclude from *Asclepias* every species which does not develop a terminal umbel. The only invariable character by which I would distinguish *Asclepias* and related genera is found in the anther-wing. The first index to a new genus is its aspect. It is the part of the systematic botanist to define, if possible, what the significant elements of this habit or aspect are. Habit is often strongly marked even where clearly accented characters are difficult to find. It is a nice genus which has both habit and clear characters.

Dr. Britton followed with description and exhibition of a new salt marsh *Scirpus*, or bulrush, from Connecticut, related to *S. robustus* of Pursh, but with different inflorescence and achene.

Dr. Britton also presented specimens of *Triosteum angustifolium* from Stratford, Conn., its previously-known stations northeast of Pennsylvania being only at New Brunswick, N. J., and Glen Cove, L. I. A large supply of roots from Stratford are now planted at the Botanical Garden to exhibit development.

WEDNESDAY EVENING, FEBRUARY 23, 1898.

This meeting was held in the large lecture hall of the College

of Pharmacy and about 150 persons were present, with Vice-President Rusby in the chair.

Arrangements were announced for summer courses in Botany, provided by the Committee of Instruction of the club. Course 1 to commence March 4, at the College of Pharmacy under Mr. W. A. Bastedo, with weekly lectures and excursions on Saturdays.

Pursuant to motion of Dr. Britton, the Chairman made this evening the announcement of the Field Committee for the year 1898, to consist of three members, with power to add to their number. The committee was announced to consist of Mr. W. N. Clute, Chairman, Prof. F. E. Lloyd and Mr. W. A. Bastedo.

The evening was devoted to an illustrated lecture by Mr. Cornelius Van Brunt on the wild flowers of the Canadian Rockies, with lantern slides exquisitely colored from nature by Mrs. Van Brunt. Numerous views of the scenery of their surroundings were shown, especially of the Selkirk mountains and about Banff. Here instead of *Rudbeckia* and *Leucanthemum*, *Gaillardia aristata* covers the fields with multitudes of purple and yellow flowers. Vetches are numerous; blue clover (lucerne) takes the place of red; turf for the lawns is composed of buffalo clover only (*Trifolium reflexum*). Beautiful examples of *Hedysarum*, *Lathyrus* and *Oxytropis* occur, among the Leguminosae, *Linnaea borealis*, *Potentilla fruticosa* and several species of *Allium* were abundant, also *Parnassia palustris* and *P. fimbriata*. Near the hotel at Banff great numbers of *Shepherdia* bushes are hung with their red berries. The red berry-like fruit of the strawberry-blite, *Chenopodium capitatum*, was seen in great abundance in parts of the Canadian National Park, as was *Galium boreale*, *Anaphalis margaritacea* and several species of *Gentiana* and *Pedicularis*. The asters were represented by *A. Fremonti;* instead of the dandelion, *Troximon*, with similar blossoms, had become the most common flower; myriads of hare-bells, apparently *Campanula rotundifolia*, dotted the roadsides, and the horse if left to himself would hunt them out as the choicest eating. One field was a beautiful mass of squirrel-grass, *Hordeum jubatum;* larkspurs grew all along the road; blue flax (*Linum perenne*) and *Rosa acicularis Bourgeana* were still in blossom. About the numerous hot springs and ponds formed from them grew plants of warmer latitudes, here blooming early, as

Gentiana detonsa in July. *Lobelia Kalmii* was blooming in the hot water. Many parts of this park have lost their beauty from the continuous forest fires. The Canadian Pacific Railroad employs watchmen whose sole duty is to guard against these fires. Digging shows that such fires have ravaged this region since times before history. The blackened ground is slowly covered by fireweed (*Epilobium angustifolium*), and, after the charred trees have fallen, by vigorous young growth of balsam spruce and pine. The abundant painted-cup disputes with the fireweed the position of the most showy flower of the region. An interesting visit to Lake Louise and neighboring glaciers was described, also to Mirror Lake, with altitude of 6480 feet. Great numbers of crossbills were met near the glacier, feeding upon pine-cones; three columbines, *Aquilegia*, were close to the snows, with *Ledum latifolium*, *Penstemon Menziesii*, *Valeriana Sitkensis* and *Arnica cordifolia*. *Habenaria hyperborea* was everywhere through the woods. The moss-campion, *Silene acaulis*, covered dry rocks, with long taproot going down three feet or more to water. Strangely enough, the night-flowering catch-fly, *Silene noctiflora*, was here in force. *Bryanthus* and *Cassiopea* were in fine flower. Lyell's larch grew higher up the mountains than any evergreen, and its bright green was already turning now in August to its autumn yellow.

After thanks to Mr. Van Brunt for these results of his summer in the Rockies, the club adjourned.

EDWARD S. BURGESS,
Secretary.

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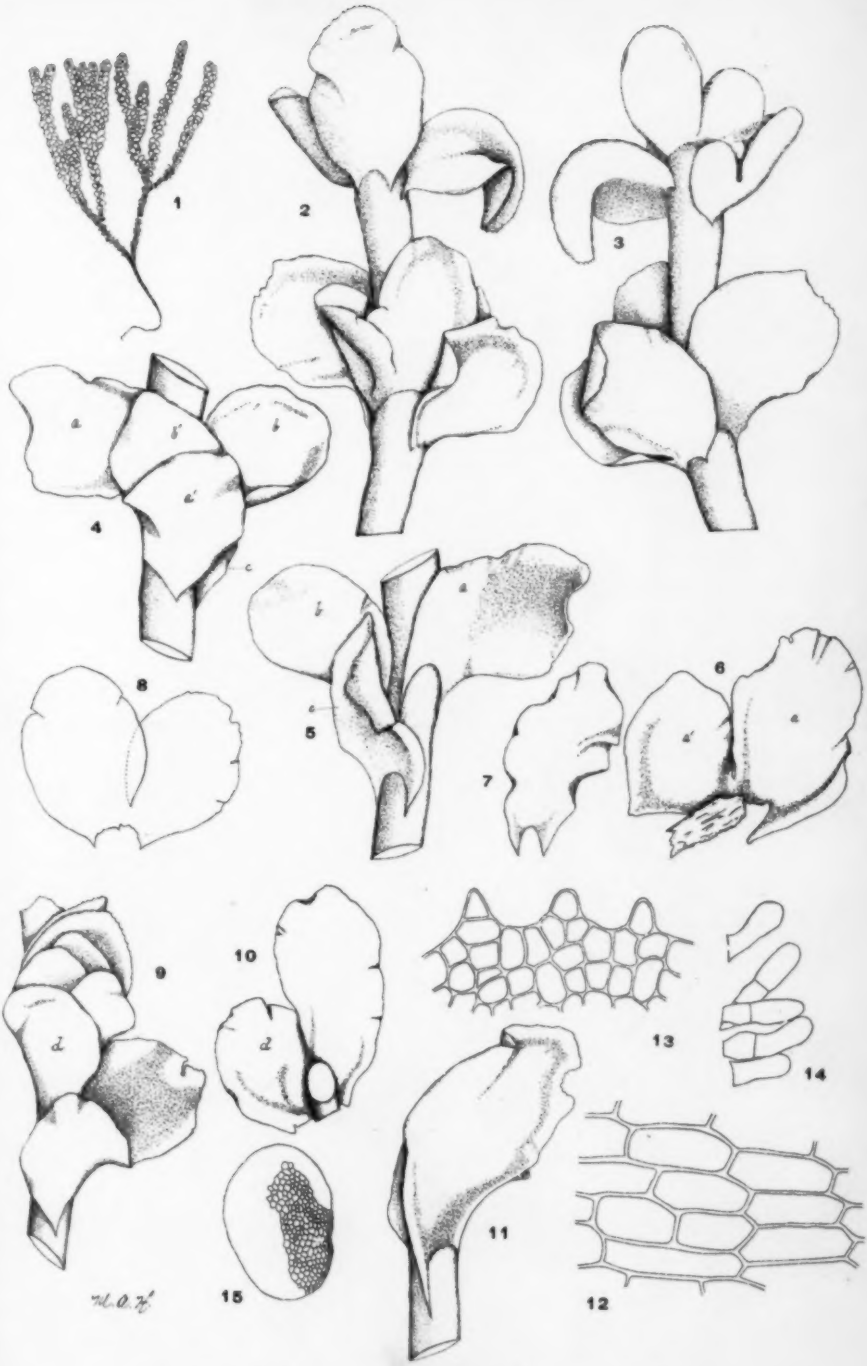

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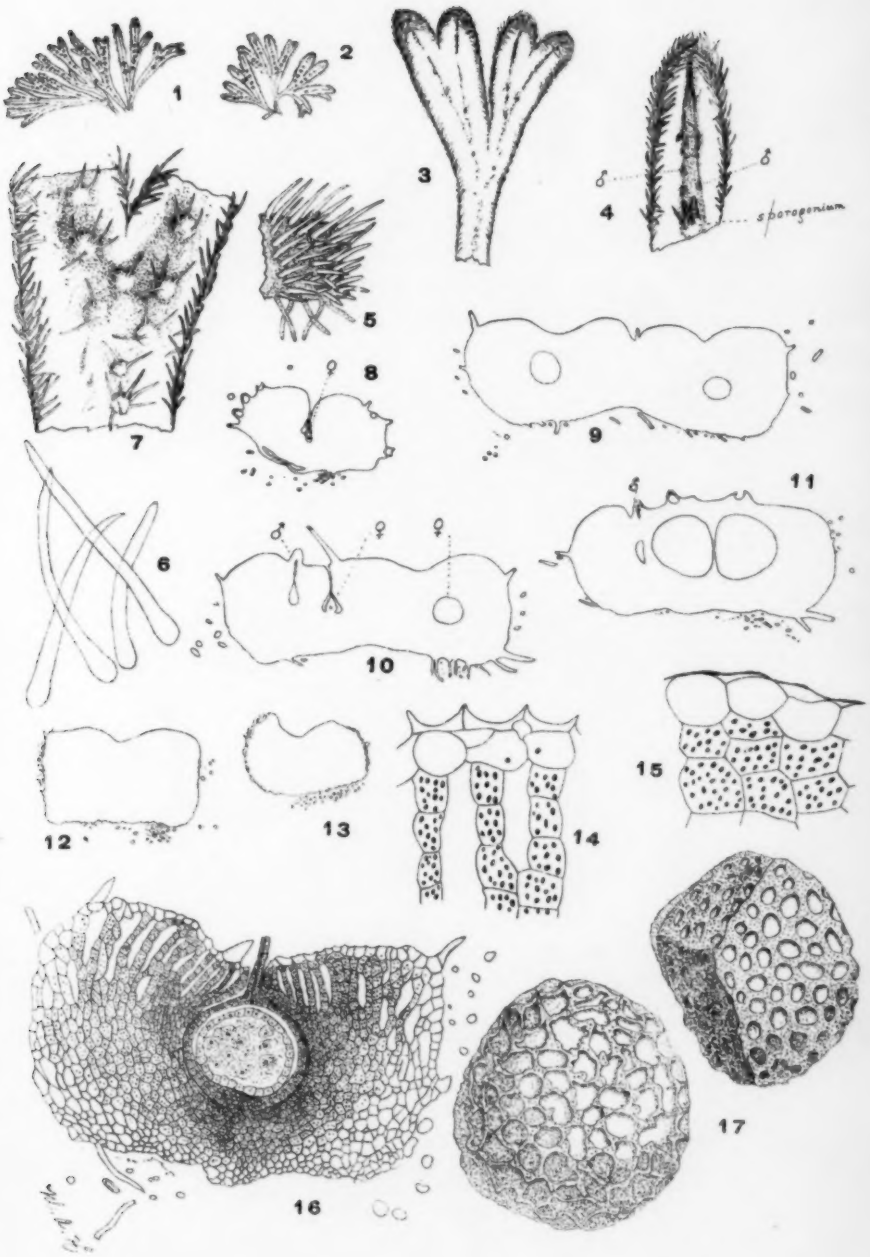

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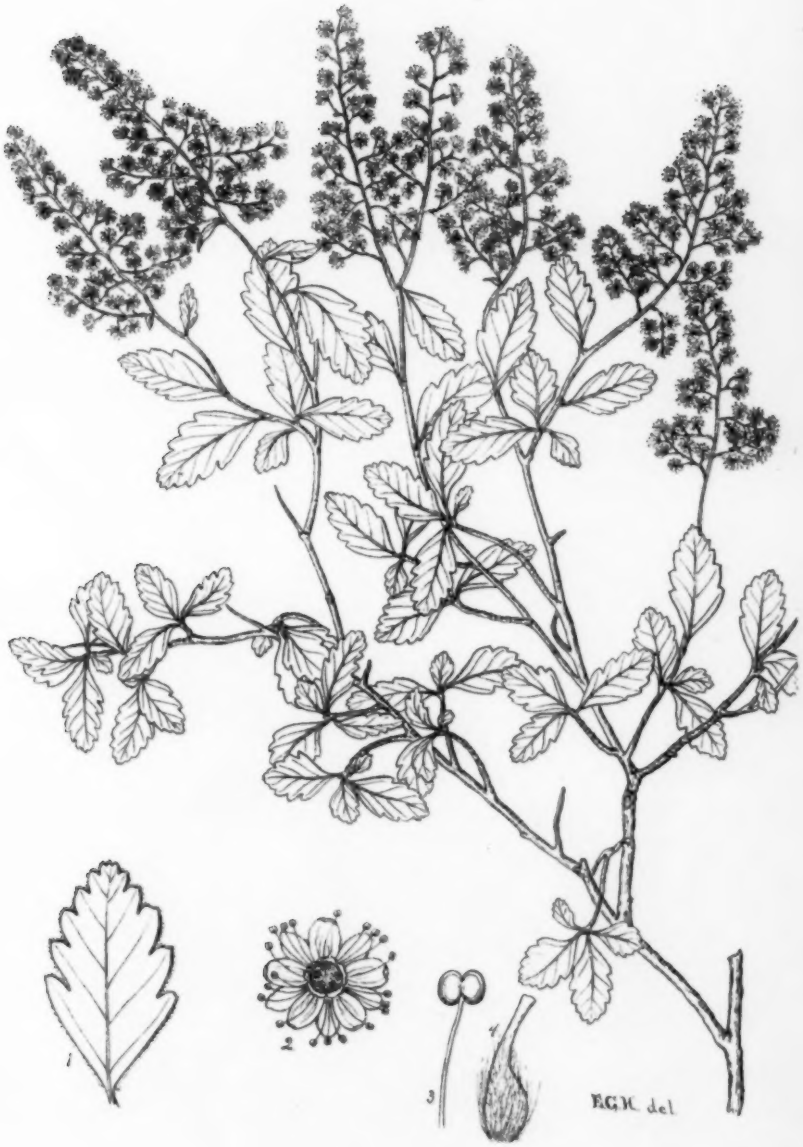

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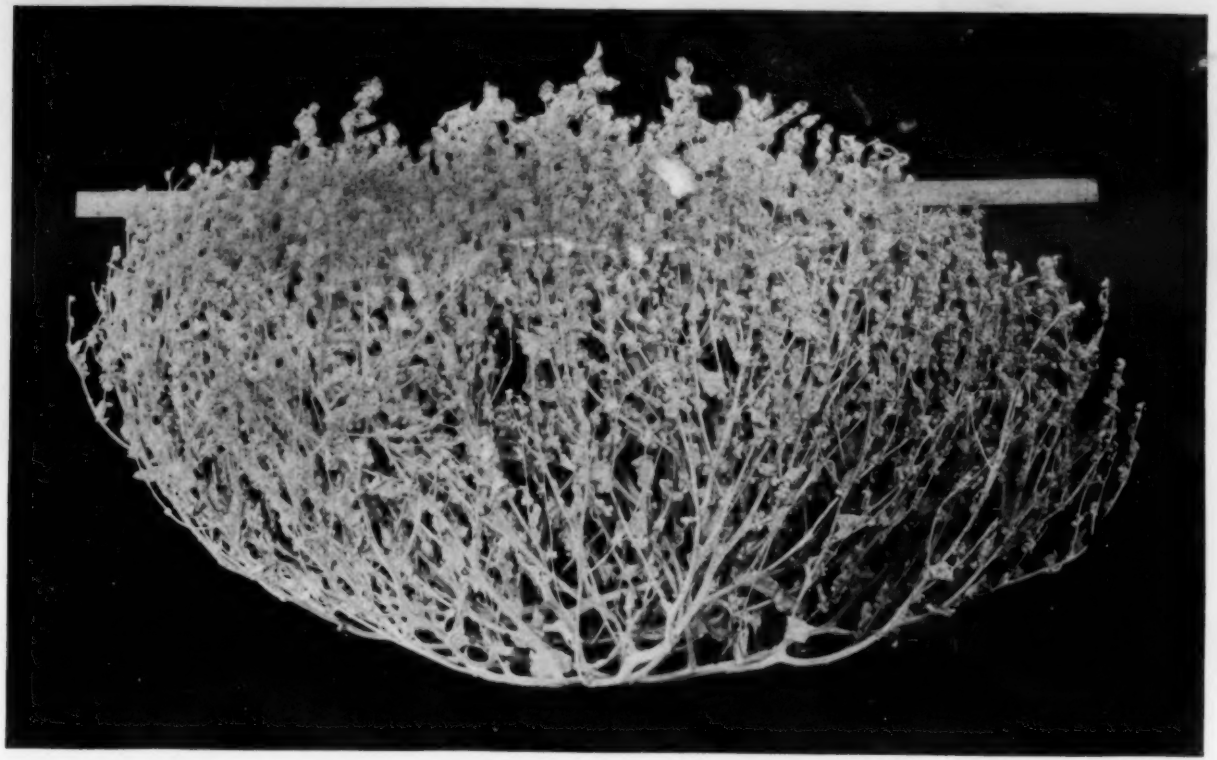

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